



FRIDAY, JULY 11, 1879.

**Twelve-Wheel Connected Locomotive.**

We have received from a correspondent a photograph, from which is made the engraving of the locomotive Pennsylvania, published herewith. Our correspondent says: "I regret that I cannot send you any data as to performance, when built, etc., but presume the Reading people could give the information. From what I can learn, it was built for use at the Richmond coal wharves of the Philadelphia & Reading Railroad in Philadelphia, and was afterward changed by removing two pairs of driving wheels, and putting under a truck."

We would be glad to receive from any source a full and trustworthy account of this engine, its history and performance, from any one in possession of the facts.

**Boiler Construction.**

[Report of the Committee on Boilers of the American Master Mechanics' Association, submitted at the convention in Cincinnati, May 14, 1879.]

(Concluded from page 365.)

Our fourth question was as follows:

"The best proportions for a boiler that will evaporate the greatest quantity of water to the pound of coal consumed, as demonstrated in practice. State the style of engine, size

nally, and which were as nearly as possible in the same general condition as to running order at the time the experiments were made. Two of these engines are in passenger service and two in freight service, one in each service having an eight-inch longer fire-box than the remaining one. These engines were then fitted up with the necessary apparatus for conducting the experiments, and placed in service over the same part of this division.

"Method of Conducting the Experiments.—For ascertaining the actual amount of water consumed, a piece of wrought-iron pipe was inserted through the top of the tank and reaching to the bottom just in front of the man-hole, and was then well braced to prevent vibration. The bottom of this pipe was closed and a number of small holes drilled near the lower end, of just sufficient area to allow the water ready access to the inside of the pipe as rapidly as the water rose in the tank when filling. A small wooden float with a stem graduated in six inches, was allowed to play up and down in this pipe with the rise and fall of the water, and held in a vertical position by passing through a slotted hole in a sheet-iron cap or cover to the pipe. By this arrangement the wooden float was but slightly subject to the oscillation and 'swashings' of the water in the tank, and indicated at any time the actual height of water.

"Care was taken to prevent the water in the tank from getting too low to buoy up the wooden float.

"Before starting out upon the experiment each tank was run upon the scale and weighed; an arbitrary number of inches of water was then allowed to run out, and the tank again weighed; from which was obtained the weight of one inch in height of water in each tank.

"During the experiments the height of the water was noted, immediately upon the engine being coupled to the train, before and after each taking of water and upon being uncoupled from train, thereby obtaining the data from which the actual weight of water used during each trip was obtained.

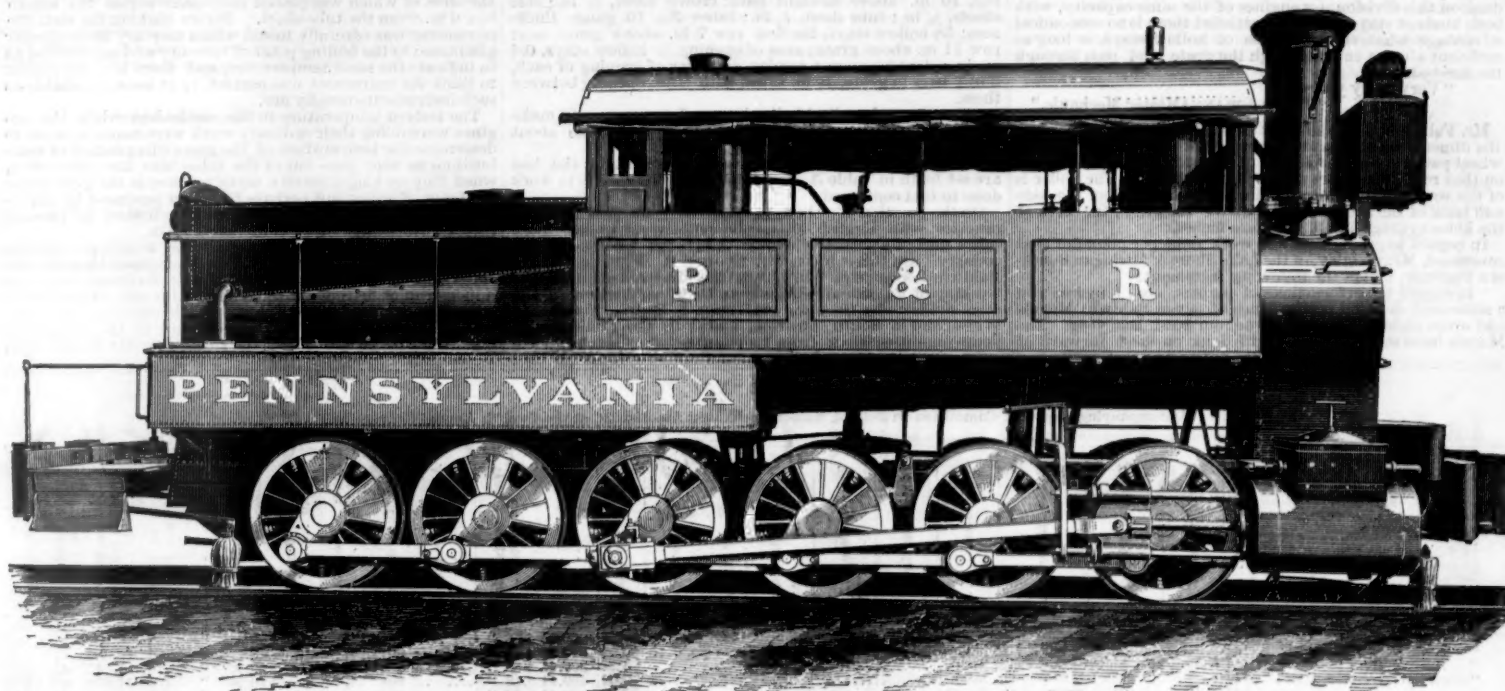
"Weight of the Coal Used.—At the beginning and ending of each series of experiments the coal in the tank was

This latter statement is borne out by the fact that in the yearly 'performance' of the two engines for 1878, Engine 150 made 35.06 miles to the ton of coal, while Engine 144 made 33.65 miles, a difference of 1.41 miles to the ton of coal in favor of Engine 150, the average train for the year on this run being six cars.

"Experimental Trips with Freight Engines 159 and 171.—These experiments were made in March and April of 1878, both engines running over the same portion of the division and as nearly as possible on through trails. Engine 159, with the smaller fire-box, and engine 171, with the larger fire-box, were both turned out of the shops after receiving general repairs in November, 1877. From the experience in the previous experiment of running each engine with its regular engineer and fireman and allow them to run both engines. They were required to make two trips with each before any records were taken. This of course necessitated the running of the engines at different times, but the result proved the advisability of the change. As will be seen by reference to Sheet A, Engine 171, with the larger fire-box, gave much the best results, averaging 3.27 miles more to the ton of coal, nearly half a pound more water evaporated to the pound of coal, and 1.67 tons more tonnage per mile per pound of coal. This result is justified by the yearly performance of the two engines for 1878, Engine 171 making 30.9 miles per ton of coal and Engine 159, 28.6 miles to the ton of coal, a difference of 2.3 miles per ton of coal in favor of Engine 171. As will be seen, the comparative yearly performance corresponds with that between engines 144 and 150, and is a further corroboration of the superior 'jockeyism' exhibited by the engineer of Engine 144 during the time of the experiment.

"In determining the average train weight when cars were only hauled a portion of the distance, the weight of the cars hauled such a distance was reduced to an equivalent weight hauled the entire distance of 113 miles, thereby obtaining in each case an average weight of train hauled 113 miles.

"Experimental Trips with Passenger Engine 144 with



TWELVE-WHEEL CONNECTED LOCOMOTIVE BUILT FOR THE PHILADELPHIA &amp; READING RAILROAD.

of cylinders, of drivers, average speed of train, the weight of engine and train, water evaporated per hour and per pound of coal, kind and quality of coal, the character of water as to the formation of scale; give area of grate, length, width and height of fire-box above the grate, area of fire-box heating surface (deducting for fire door and tube holes), area of tube surface (taking inside diameter), number, length and diameter of tubes; kind of tubes, spaces between them, water spaces around the fire-box, depth of water on crown sheet; weight of water in the boiler in working condition; diameter of boiler at the middle of its length; 'Straight' or 'Wagon-top' pattern; thickness of fire-box sheets, and of tubes; area of hollow stays, if any, and where situated; single or double-exhaust nozzle, and diameter of same; thickness of bars in the grate, and space between them. It is important to know the proportions, as above, of boilers evaporating the greatest quantity of water to the pound of coal, and your committee will be glad to get the data as indicated in the case of locomotives giving the best results in evaporation, as a means of determining whether any change from the proportions of boiler now in general use can be made that would result in economy in the use of fuel. We earnestly solicit replies to the above."

In reply we have received communications from several master mechanics and superintendents of motive power which we present with this report. That of Mr. Johann, of the Wabash Railway, is as follows:

"Wabash Railway, Western Division.  
"Reuben Wells, Esq., Chairman of Committee on Locomotive Boilers."

"DEAR SIR: I propose to give, in the following paper, the results of a series of experiments made by me during the past year to determine the economical superiority of a large over a small fire box and boiler with the same cylinder capacity; basing this superiority upon the tonnage per mile per pound of coal instead of upon the miles run to the ton of coal and the water evaporated per pound of coal, as has been the practice in nearly all experiments that have come under my observation. Having but one class of engines on this division, namely, the ordinary eight-wheeled or four-coupled 'American' engine, I am necessarily confined in my experiments to existing differences in this one class of engine. And, furthermore, as the majority of the boilers of these engines are of the wagon-top form, and possess little difference in their capacity, my field for experiment in this direction is exceedingly limited. The chief difference in the boilers of these engines consists in some having an eight-inch longer fire-box, and consequently more steam and water capacity for the same dimension of cylinders. For the purpose of experiment four engines were selected, which were of the same make origi-

nally. While on the road the weight in pounds as given at the coal chutes was assumed to be correct.

"Pyrometer.—The pyrometer used during the experiments was kindly loaned by Prof. Charles A. Smith, of Washington University, St. Louis, Mo., and is marked 'Casartelli, Manchester.' It is graduated to show a temperature of 1,200°. It was projected as near as possible through the top of the smoke arch about five inches in front of the flue-sheet, and extended nearly to the bottom row of flues. By these crossing all the horizontal rows of flue-openings, an average temperature of the gases passing through them was more nearly obtained. On the passenger runs the reading of the pyrometer was noted every three minutes, and on the freight runs every four minutes, together with the position of the reverse lever. In obtaining the average temperature during each trip, all readings obtained after shutting off steam were discarded, together with temperatures in starting out of stations, as it was noticed that the pointer rose rapidly when warming up, and then gradually settled back.

"Temperature of Feed-water.—The temperature of the water, as indicated by a thermometer placed in the tank was noted at stated time during each trip, and an average temperature for each series was obtained from these.

"Weight of Passenger Trains.—In estimating the weight of the passenger trains, the numbers and classes of cars composing each train was noted, and from the official record the weight of these cars was obtained. The weight of the passenger load was obtained by counting the number on the train at different times during each trip, and an average was taken, and 130 lbs. weight allowed for each passenger.

"Experimental Trip with Passenger Engines 150 and 144.—These experiments were made in August, 1878, both engines running at the same time and in the same service. Engine 144 was turned out of shop after receiving general repairs on April 13, 1878. Engine 150 when taken into shop the last time was of the same dimensions as Engine 144. The fire-box and leg of boiler were then lengthened out eight inches and the engine was turned out of the shop after receiving general repairs March 15, 1878. These engines were then started out on the experiment in their regular runs, each engineer running his own engine. As the engines on this division are run 'first in first out,' each engine made one or more trips with the same trains. By a reference to Sheet A, which contains the tabulated results of this series of experiments, it will be seen that Engine 144, with the smaller fire-box, shows trifling better results as to coal and water consumption and tonnage per mile than Engine 150. This may be accounted for, however, by the facts that the average train was heavier and, consequently, the engine was working nearer its maximum capacity, and that the engineer used extra precautions during the trial, while the engineer of Engine 150 ran as usual.

"Closed and Hollow Stay-bolts.—The class of engine to which 144 belongs came on this road fitted up with two rows of hollow stay-bolts around the fire-box. In the winter of 1876 and 1877, the engineer of Engine 144 made serious complaint as to the difficulty in obtaining sufficient steam, and attributed this difficulty to the hollow stay-bolts. I then had them plugged up with red lead, with a marked improvement in the engine's steaming qualities. The hollow stays on other engines of the same class were filled in the same manner and with the same result, and I then discontinued the use of hollow stays. In order to justify myself for this discontinuance I made a series of trips in March, 1879, one series with the stay-bolts still closed and another with the stay-bolts opened out. These stays were 80 in number, with  $\frac{1}{4}$  in. openings arranged with 18 in the front and back and 22 on each side of the fire-box, the height of the first row above the top of the grate being 11 in. and the distance between the rows 4 in., the total area of the openings being 12,027 square inches. The results of these experiments are also given in Sheet A. The evaporation of water to the pound of coal is a trifle better with the open than with the closed stay-bolts, yet the average tonnage is nearly  $\frac{1}{10}$  of a ton per mile per pound of coal less.

"Pyrometer Experiments for Ascertaining the Average Temperature of the Gases in the Smoke-box.—At the time of making the open and close stay-bolt trips, the temperature of the smoke-box gases was also noted. By a reference to Sheet A, which contains the results, it will be seen that the average temperature of the escaping gases was greater with the closed than the open stays, but at the same time the tonnage per mile was proportionately much greater. This experiment shows also the effect of an increased speed in increasing the average temperature of the gases. The rate of speed of Train 6 being 19.26 miles, and of Train 3, 34.77 miles per hour, the average temperature of gases in both cases being greater for Train 3 than for Train 6, while still the temperature of the gases varied from 375° to 400°, and while going into stations, after shutting off steam, 500° to 550°. On opening the fire door for the purpose of 'coaling up,' the temperature dropped from 50° to 75°. The number of seconds required for the smoke to clear away from the stack was also noted at various times and under various circumstances, the timing beginning immediately after closing the fire door on the last shovel of coal. With the closed stays it required on the average 41 seconds, and with the open stays 38 seconds for the smoke to disappear.

"On Sheet A will also be found the results of the pyrometer tests with the two freight engines 159 and 171. The average temperature of Engine 171, with large fire-box, is much greater than with Engine 159. But again it will be noticed the engine showing the highest average temperature



has also much the largest average tonnage per mile. In this experiment it was observed that when the engine was working hard and moving slow with the lever full forward the highest temperature was obtained, but if the lever was moved back slowly as the speed increased the temperature fell but little, the length of the blasts being shortened but their rapidity increased. The ruling grades over which the engines run are given in Table A. An analysis of the coals used, which were of a kind known as Illinois block coal, shows the average to have been as follows:

Caloric power.....	6,555°
Density.....	2,586°
Power as compared with carbon as 100.....	81.36

"From the results obtained from these experiments, I arrive at the conclusion that the boiler with the largest capacity to any given size of cylinder is the most efficient and economical. And while aware that under certain conditions the smaller boiler shows an equally good performance, yet when loaded to the fullest capacity of the cylinder power, the larger boiler will invariably appear to better advantage in economy and work performed. In reference to the escape of gases, at very high temperatures, from the stack, there is no remedy as long as we use the exhaust nozzles to create a blast. The proper remedy can only be obtained by increasing the grate area and heating surface to allow the gases a longer time for complete combustion in the fire-bed and thereby be enabled to enlarge the exhaust nozzles, thus preventing the violent lifting of the fire and expulsion of the gases before the heat is extracted by the water. Under the present condition of things this is hardly attainable, for want of sufficient space.

"The results of the experiments with hollow or open stay-bolts, as compared with solid or closed stay-bolts, indicate an advantage in favor of the solid stays. Although in the case of the hollow stays, there was not so much smoke, nor was the temperature of the escaping gases so high as in the case of the closed stays, there was a decided economy in work done in favor of the latter. From my observations, not only from these experiments but from the general work done on this division, by engines of the same capacity, with both kinds of stay-bolts, I am satisfied there is no economical advantage whatever in the use of hollow stays, as long as sufficient air can enter through the grate and pass through the fire-bed.

"Very truly yours,

"JACOB JOHANN, Master Mechanic."

Mr. Fuller, of the Atlantic & Great Western Railway, gives the dimensions of a passenger engine of the ordinary eight-wheel pattern, and the results of a test made with the same on that road, which are set forth in Table A. The boiler is of the wagon-top pattern, having hollow stays on the side and back of the fire-box 12 in. above the grate, the area of the holes aggregating 3.83 square inches.

In regard to proportions and work done per pound of coal consumed, Mr. Sedgley, of the Lake Shore & Michigan Southern Railway, makes the following statement:

"In regard to performances of engines, etc., I inclose you a statement showing performance of seven Baldwin Moguls and seven eight-wheel engines on our road last year. The Moguls have straight boilers with dome on sheet forward of

fire-box, 148 2-in. tubes 11 ft. 2 in. long, with fire-box 5 ft. long and 5 ft. deep, 35 in. wide, and heating surface 846 ft. inside measure; 18 x 24 cylinders and 4 1/2-ft. wheels. The 8-wheel engines have wagon-top boiler, dome over fire-box, the latter 5 ft. 5 in. long and 5 ft. 3 in. deep, 35 in. wide; 155 2-in. tubes 11 ft. 1 in. long; heating surface 893 ft. inside measure; 17 x 24 cylinders; 5-ft. wheels. Both engines in similar condition, services, etc., it would seem to be a very fair test.

"The seven Mogul engines made a total mileage of 228,057 miles with an average load of 41.95 loaded cars per train-mile and a consumption of 1.73 lbs. of coal per car. The seven eight-wheel engines made a total mileage of 221,100 miles, the average load being 41.24 cars per train and consumption of coal 1.77 lbs. per car per mile."

From this report it seems that the seven Mogul engines with the straight boiler and a heating surface of 846 ft. did 2.20 per cent. more work to the pound of coal than the eight-wheel engines with wagon-top boiler and 893 ft. per cent. more heating surface. The work done by all these engines to the pound of coal is remarkably good. Mr. James M. Boon, of the Pittsburgh, Fort Wayne & Chicago Railway, in giving the result of a test of one of his boilers, says:

"This engine is the ordinary American engine, with cylinders 16 x 24 in., drivers 66 in., weight of engine 73,000 lbs., weight on drivers 46,700 lbs. Coal used was bituminous, of a fair quality, known as 'State Line' coal. The water is bad, forming scale very rapidly. Grate area, 15 square feet; fire-box, 60 in. long, 36 in. wide; at front end, fire-box is 55 1/2 in. high; at back end, 50 1/2 in. high above grate, crown-sheet being on an angle. Heating surface of fire-box, 86.1 sq. ft.; area of tube surface, 745 sq. ft.; tubes, 1,490, 11 ft. long, 1 1/2 in. inside diameter, iron tubes; space between them, 1/2 in. back and 1 1/2 in. front end; front of fire-box, 4 in. water space; sides and back end, 3 1/2 in. With two gauges of water, 6 in. depth of water in front end of crown sheet and 11 in. on back end. With two gauges the weight of water in boiler is 6,550 lbs. in working condition. Boiler is 48 1/2 in. in diameter in middle of its length; wagon top, 10 in. above straight part; crown sheet, 1/2 in.; side sheets, 1/2 in.; tube sheet, 1/2 in.; tubes No. 10 gauge thickness; 58 hollow stays, the first row 7 in. above grate, next row 11 in. above grate; area of opening in hollow stays, 6.4 sq. in.; double exhaust nozzles, diameter of opening of each, 3 in.; bars in grate, 3/4 in. thick, with 3/4 in. opening between them.

"The above described boiler is a good steamer; will make steam freely with nut coal; does the best work with about 4 in. of coal on the grate."

The proportions of this engine and the result of the test are set forth in Table A, and show very good results in work done to fuel consumed.

On the question of "best proportions," we find that the practice with English locomotive-builders is to use more tubes, and of a smaller diameter than is the practice in this country. On this subject, Mr. Edward H. Williams, of the Baldwin Locomotive Works, who has observed carefully the working of English and American-built locomotives on the same roads under the same conditions, in Russia, New South Wales, and in South America, states to the Chairman of your committee that, from his observation of English loco-

motives, he does not think their boilers show any greater economy of fuel than ours, when the work done is considered. English boilers generally have smaller fire-boxes and more tubes than American boilers for the same cylinders. For example, of the first locomotive which the Baldwin Locomotive Works built for New South Wales, the general dimensions were as follows: Cylinders, 18 in. x 24 in.; driving-wheels, 62 in. diameter; diameter of boiler, 50 in.; 187 tubes 2 in. diameter, 10 ft. 3/4 in. long; fire-box 72 in. long, 34 1/2 in. wide. They had in New South Wales English locomotives of substantially the same plan, and cylinder and driving-wheels of the same dimensions; the boilers, however, had more tubes, and a fire box 48 in. long x 40 in. wide. They get the greater width by using slab frames. As a matter of fact, under Mr. Williams' observation, he states that the American engines pulled a greater number of cars than the English locomotives of the same class, and showed a greater economy in the use of fuel per car per mile.

The Chairman of your committee made a series of tests of temperature in the smoke-box of four freight and three passenger engines on the Jeffersonville, Madison & Indianapolis Railroad a few weeks ago, the results of which are set forth in Table A, together with the proportions of the boilers, weight of train, speed, and other matters relating to the circumstances under which the tests were made. The tests of temperature in the smoke-box made on the Jeffersonville, Madison & Indianapolis Railroad with the freight engines were all over the same part of the road, going in the same direction, using the same kind of coal, and on the same trains (night freight). The distance run for each test was 38 miles. The distance run in making the other tests are given in Table A. The tests with passenger engines were over the same part of the road, going the same way, the runs being 49 miles, testing smoke-box temperature. All other particulars are set forth in Table A. In each case the temperature indicated by the pyrometer was recorded every thirty seconds and the steam pressure noted every minute.

The instrument used was one of Ashcroft's pyrometers the stem of which was placed diagonally across the smoke box 6 in. from the tube-sheet. Before making the tests the pyrometer was carefully tested with a mercury thermometer graduated to the boiling point of mercury and adjusted so as to indicate the same temperature, and there is every reason to think the instrument was correct, or at least as reliable as such instruments usually are.

The tests of temperature in the smoke-box while the engines were doing their ordinary work were made in order to determine the temperature of the gases (the product of combustion) as they pass out of the tubes into the smoke-box, when they no longer serve a useful purpose in the generation of steam, if we except perhaps the effect produced by superheating the steam on its way to the cylinders in passing through the heated pipes in the smoke-box.

A column in Table A gives the average temperature in the smoke-box of a number of different engines, those on the Jeffersonville, Madison & Indianapolis Railroad for a continuous run of 38 miles with freight trains and 49 miles with passenger trains for each test. While standing, and with only the natural draft, the temperature in the smoke-box was from 375° to 450° Fahr., the steam pressure at the time

TABLE "A."

[Accompanying Report of Committee on Boilers, Master Mechanics' Association, at the Twelfth Annual Convention.]

ROAD.	No. of engine.....	Size of cylinder.....	Diam. of drivers.....	Style of boiler.....	Grate area.....	Fire-box surface.....	Tube surface.....	Total heating surface.....	Number of tubes.....	Weight of water in boiler.....	Coal per mile, lbs.....	Water per mile, lbs.....	Water evaporated to 1 lb. coal.....	Average steam pressure.....	Smoke-box temperature, degrees Fahr.....	Diam. of exhaust nozzles.....	Number of cars in train.....	Speed per hour, miles.....	Train.....	Weight of engine and train, tons.....	Lbs. of engine and train, 1 mile to 1 lb. coal.....	Miles run, test.....	Rolling grade, ft. per mile.....	Lbs. of engine and train, 1 mile to 1 lb. coal.....	Miles run, test.....
Wabash.....	144	16x24 5 ft. 6 in.	6 in.	Wagon top	13.13 ft.	81.6 ft.	764 ft.	845.6 ft.	146	6,400 lbs.	57.41	276.89	4.82 lbs.	908°	284°	6	28.64	Pass.	196	6,643	41	904			
"	150	16x24 5 ft. 6 in.	6 in.	"	15.30	88.6	808.3	786.9	138	7,600 "	58.98	280.46	4.76 "	908°	284°	7	28.31	"	182	6,192	41	1,130			
"	144	With 80 hollow stay-bolts, 7-16 holes total area = 12 sq. inches	Train No. 3.	"	15.30	88.6	808.3	786.9	138	7,600 "	58.98	280.46	4.76 "	908°	284°	6	34.77	"	186	5,334	41	113			
"	144	Hollow stay-bolts closed	Train No. 3.	"	15.30	88.6	808.3	786.9	138	7,600 "	58.98	280.46	4.76 "	908°	284°	7	34.77	"	216	5,745	41	113			
"	144	"	"	"	No. 6.	"	"	"	"	"	57.52	409.41	5.18 "	855°	284°	6	19.26	"	464	11,670	41	113			
"	144	"	"	open	No. 6.	"	"	"	"	"	57.52	332.41	5.78 "	855°	284°	6	19.26	"	227	9,480	41	113			
"	150	16x24 5 ft.	5 ft.	Wagon top	13.13 ft.	81.6 ft.	719.4 ft.	801.2 ft.	138	6,360 lbs.	82.91	397.97	4.79 "	778°	284°	30	.....	Fr't.	556	11,136	41	536			
"	171	16x24 5 ft.	5 ft.	"	15.30	88.7	749.9	830.6	146	7,200 "	73.01	381.68	5.23 "	897°	284°	33	.....	"	612	12,244	41	10.93			
P. Ft. W. & C.	121	16x24 5 ft. 6 in.	6 in.	"	15	86.1	745	831.1	146	6,550 "	31.00	197.00	6.57 "	897°	284°	5	30.00	Pass.	161	10,380	30	393			
A. & G. W.	16	17x24 5 ft. 6 in.	6 in.	Straight.	13	96	808	904	160	8,000 "	82.00	.....	4.70 "	129 lbs.	734°	30	16.46	Fr't.	653	15,920	30	108			
J. M. & I.	16	17x22 5 ft.	5 ft.	Straight.	13	90	850	920	153	7,000 "	67.00	412.58	6.20 "	129 "	714°	27	19.35	"	224	.....	30	108			
"	28	16x24 5 ft.	5 ft.	Straight.	13	90	850	920	153	7,000 "	67.00	412.58	6.20 "	128 "	712°	29	14.52	"	652	19,460	30	216			
"	28	Trip No. 2.	"	"	13	90	850	920	153	7,000 "	67.00	412.58	6.20 "	130 "	873°	25.5	15.20	"	333	10,025	30	108			
"	28	Old boiler.	6 ft.	Wagon top	12.5	70.5	639.5	707	114	6,000 "	83.19	460.00	5.54 "	117 "	827°	14	15.00	"	572	13,760	30	216			
"	7	16x24 5 ft.	5 ft.	"	12.5	70.5	639.5	707	114	6,000 "	83.19	460.00	5.54 "	114 "	783°	27-16	26.5	16.00	"	572	13,760	30	216		
"	7	Trip No. 2.	"	"	12	77.5	616.5	604	113	5,700 "	58.70	356.30	6.07 "	123 "	721°	26	17.50	"	465	15,840	30	432			
"	30	14x22 5 ft.	5 ft.	Wagon top	12	77.5	616.5	604	113	5,700 "	58.70	356.30	6.07 "	124 "	730°	21	16.50	"	193	.....	30	108			
"	22	14x22 5 ft.	5 ft.	"	12	77.5	616.5	604	113	5,700 "	58.70	356.30	6.07 "	126 "	707°	25	33.10	Pass.	167	7,952	30	432			
"	22	Trip No. 2.	"	"	12	77.5	616.5	604	113	5,700 "	58.70	356.30	6.07 "	126 "	779°	4	35.30	"	168	9,150	30	432			
"	4	15x22 5 ft. 6 in.	6 in.	"	12.5	81.5	719.5	801	120	6,000 "	36.80	.....	.....	122 "	713°	4	35.30	"	168	9,150	30	432			

## PROPORTIONS OF LOCOMOTIVE BOILERS.

[Communicated by Howard Fry, Philadelphia & Erie Railroad, to Committee on Boilers, Master Mechanics' Association.]

Maker.	Class.	Cylinder.		Wheels.	Diameter of boiler.	FLUES.			AREAS.		HEATING SURFACE.		RATIOS OF SURFACES.			
		Diameter.	Stroke.			Number.	Diameter.	Length.	Grate.	Sectional through flues.	Fire-box.	Flues.	Pine to fire-box.	Heating to grate.	Grate to sectional area through flues.	
Baldwins.	Passenger.	17"	24"	4	5' 6"	101	2"	11' 8"	15.3	2.68	103.3	975	0.4	70.4	5.7	A
Schenectady.	"	17"	24"	4	5' 6"	100	2"	11' 0"	15.8	2.68	104.0	940	0.1	66.6	5.8	B
Atlas Works.	"	18"	25"	4	6' 0"	219	1 1/2"	10' 6"	17.7	3.29	105.0	1,134	10.8	70.0	5.38	C
London, Brighton & South Coast.	"	"	"	"	"	125	1 1/2"	8' 3"	10.0	1.53	55.0	470	8.54	62.5	6.53	D
London & North Western.	Freight.	17"	24"	4	4' 3"	198	1 1/2"	10' 4"	16.9	2.65	104.3	1,004	6.62	65.5	5.93	E
Midland Railway.	Passenger.	17"	24"	4	5' 0"	221	1 1/2"	11' 0"	16.7	2.71	104.4	1,105	10.5	72.4	6.18	F
London, Brighton & South Coast.	Freight.	17 1/4"	20"	4	5' 0"	311	1 1/2"	10' 8"	19.3	3.81	90.0	1,520	16.8	83.4	5.06	G
Great Northern.	Passenger.	18"	28"	4	8' 0"	217	1 9-16"	11' 9"	17.8	2.23	122.0	1,043	8.5	66.2	7.8	H
London, Chatham & Dover.	"	17"	24"	4	6' 6"	"	"	"	16.0	"	100.0	1,080	"	"	"	I
North Staffordshire.	"	16"	24"	4	5' 6"	3' 10"	"	"	14.0	"	81.0	870	"	"	"	J
Canadian Railway.	Freight.	17"	24"	6	4' 6"	4' 0"	"	"	14.2	"	86.0	955	"	"	"	K
Bristol & Exeter.	"	17"	24"	6	5' 0"	4' 3"	"	"	17.9	"	90.9	845	"	"	"	L
Northeastern.	"	17"	24"	6	5' 0"	4' 1"	"	"	15.1	"	101.4	1,103	"	"	"	M
Glasgow & South Western.	"	18"	24"	6	5' 2"	4' 3"	"	"	14.2	"	86.0	960	"	"	"	N
London & South Western.	Mixed.	18 1/2"	26"	4	6' 6"	4' 1"	"	"	18.2	"	135.0	800	"	"	"	O
Southeastern.	Passenger.	17"	24"	4	6' 6"	4' 1"	"	"	15.0	"	92.0	1,061	"	"	"	P
Lancashire & Yorkshire.	Freight.	17 1/4"	26"	6	4' 6"	4' 3"	"	"	18.7	"	90.5	943	"	"	"	Q
Metropolitan.	Passenger Tank.	17"	24"	4	5' 0"	3' 11"	"	"	18.6	"	103.0	903	"	"	"	R
Great Eastern.	Freight.	19"	26"	6	4' 10"	4' 5"	"	"	17.8	"	103.0	1,303	"	"	"	S
London & North Western.	Passenger.	17"	24"	4	6' 6"	4' 1"	"	"	17.1	"	103.5	980	"	"	"	T
Brooks Locomotive Works.	"	17"	24"	4	5' 0"	4' 0"	"	"	15.6	2.77	103.7	900	"	"	"	U



being from 100 to 138 lbs. per inch. When starting a train the temperature would in many cases increase as much as 400° in two minutes, going up as high as 875°, 900° and 925° within three minutes of the time of starting, when a full pressure of steam was used.

It might be supposed that the smoke-box temperature and the steam pressure of the boiler would bear a close relationship to each other, yet this was not the fact. The temperature depended on that generated in the fire-box and the strength of the draft at the time. The stronger the draft, the higher the temperature in the smoke-box, other things being equal, was the rule. The draft being strong, the gases pass through the tubes in so short a time that but little heat is imparted to the water surrounding them, by a given volume of the gases, as compared with what would occur if more time was given.

The temperature of the water due to a steam pressure of 140 lbs. is, in round numbers, 350°, and if the temperature is increased the pressure is of course correspondingly increased, and *vice versa*. Temperature always tends towards an equilibrium: if that of the gases is higher than the water surrounding them, the tendency to equilibrium will cause the heat to pass to the water. The rapidity of its passage, in point of time, will, however, depend upon the difference in the temperature of the two; the greater that difference the more rapid its passage, other things being equal. This fact may be proven by placing two pieces of metal of the same kind and cubic contents in perfect contact, the one piece being of a temperature 2° higher than the other. Then note the time that elapses until both are of the same temperature (the one losing 1 degree and the other gaining as much); then take the same two pieces and increase the temperature of one to, say, 500°, while the other is at 70°; then place the two in contact and note the time required to raise the temperature of the latter to 71° and reduce that of the former to 499°. It will be found that in the latter instance the time is much less than in the former. In ~~the~~ case, however, *time* is required. It is an element always to be considered in the transmission of heat. Referring to Table A, and the results of the test made with the Jeffersonville, Madison & Indianapolis freight engine No. 16, with a train of 30 loaded cars, at an average speed, while using steam, of 16.46 miles per hour, and an average steam pressure of 129 lbs. per inch, the average temperature in the smoke-box while steam was used, for the 38 miles run, was

same quality or fuel as in the case of No. 22, at an average speed of 35.3 miles per hour, showed an average steam pressure of 152 lbs., and a smoke-box temperature of 713°, being 36° less than the case of No. 22, with the same train and the same speed; the steam pressure being but 4 lbs. less. Engines Nos. 4 and 22 have both run passenger trains for several years past, running the same trains on alternate days; the difference in the heating surface of the two boilers is mainly in tube surface, and is, in round numbers, 13 per cent. The fuel account for the last year shows that No. 4, with the largest boiler, used 9 per cent. less fuel in doing the same work as the No. 22, and the test of smoke-box temperature shows that it was also 9 per cent. less in the large boiler.

The tests of temperature in the smoke-box, reported by Mr. Johnston, are, on the average, higher than those reported for engines on the Jeffersonville, Madison & Indianapolis Railroad, being for passenger trains of six and seven cars at a speed of 28.6 and 34.7 miles per hour, from 908° to 944° while using steam; for freight engines the average corresponds with that in the engines on the Jeffersonville, Madison & Indianapolis road of the same class, doing equal work.

Now, if the gases leave the tubes and pass out of the stack at a temperature of about 400° above that of steam at 140 lbs. pressure, the question naturally arises, cannot a portion of this surplus heat be utilized by a change in the proportions of our boilers, so that the heated gases could be retained longer in contact with the cooler water surfaces, a proportioned quantity of their heat would be absorbed by the cooler body; and, if absorbed, it would give out its equivalent in work done by the engine. How then can the heated gases be retained longer in contact with the water-surfaces (heating surface)? To produce a high temperature in the fire-box, a good draft is absolutely necessary to supply the requisite oxygen, that combustion there may be as nearly perfect as possible. The nearer it is perfect the higher will be the temperature of the gases which are the product of that combustion, other things being equal. After the chemical changes known as combustion have taken place in the fire-box, generating the highest temperature due to the fuel used, the desired object then is to retain the heated gases as long as possible in contact with the heating surfaces, so that as much heat as possible may be absorbed by the water. How then may the object be accomplished?

If we assume that a boiler with a given size of fire-box has

locomotive which will utilize, or take up, all the heat from the gases above that of the steam within it; yet, when the greatest economy in the operations of our railroads is a matter of necessity it would seem that we should make further efforts at obtaining greater results in work done to fuel consumed than has been done heretofore, by endeavoring to proportion our boilers so as to extract at least a portion of heat which our tests have shown is constantly being carried through and out of the tubes, while the engines are doing their work, and which is practically wasted.

As regards economy in fuel, much depends also on the care and judgment exercised, both in running and firing the locomotive, and the condition of the heating surfaces as to scale, as well as on the proportions of the boiler.

Further, upon the subject of "the best proportions," your committee have received the following communication from Mr. Howard Fry, Superintendent of Motive Power of the Philadelphia & Erie Division of the Pennsylvania Railroad, giving the proportions of the best patterns of English locomotive boilers in tubular form, also that of some of the best American patterns, together with sketches of some of each. Mr. Fry's very valuable and interesting contribution to our report is as follows:

"REUBEN WELLS, Esq., *Chairman Boiler Committee American Master Mechanics' Association* :

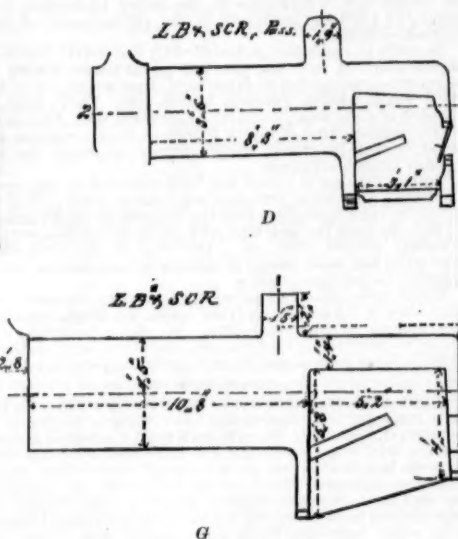
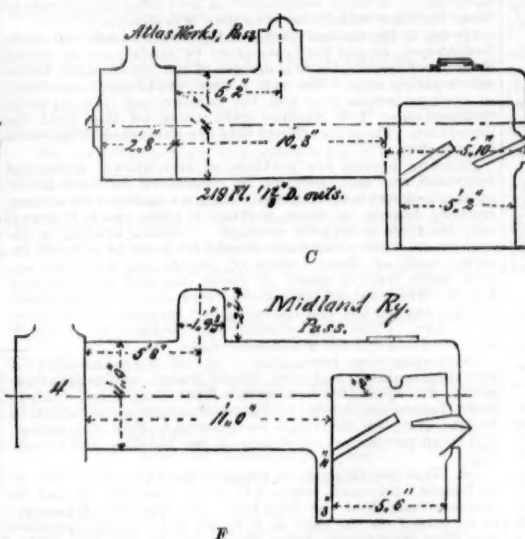
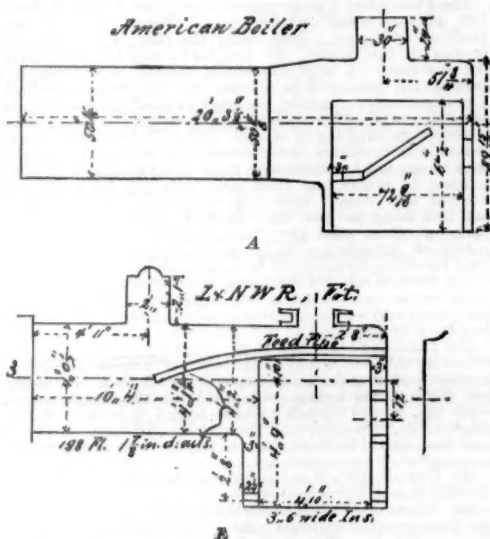
"DEAR SIR: Herewith I beg to submit for the use of your committee a table giving some leading dimensions of English locomotive boilers. The figures are all taken from private information in my possession, and represent the best and most recent practice.

"I have added to the list similar dimensions of three American locomotives by first-rate builders.

"You will note that there is no material difference in the proportions of grate and fire-box surface between the American and English engines designed for similar work. Thus, engines A, B, E, I and U are nearly alike in these dimensions.

The principal difference is in the flue surface, which is greater in height than in American practice. This extra surface is gained by using smaller flues and more of them. You will, however, note that the proportion between the diameter and length of the tubes, or, as it is technically termed, the 'calorimeter,' does not greatly vary. A calorimeter of about 80 may be taken as representing the best practice in both countries.

<sup>14</sup> Attached to this report are a few rough sketches which



734°, or a little more than double that due to the steam pressure for that run.

The boiler may be considered as one of fair proportions with perhaps more heating surface than the average for that size cylinder, having 964 square feet.

Engines 159 and 171 on the Wabash road, with freight trains of 30 and 33 loaded cars, show an average smoke-box temperature while using steam of 778° and 897° respectively.

ively.

Engine No. 28, on the Jeffersonville, Madison & Indianapolis road, with an old boiler of only 730 ft. of heating surface, and which at the time was badly scaled, at a speed of 15 miles per hour, with a train of 14 loaded freight cars, and an average steam pressure of 87 lbs. while using steam, showed an average smoke-box temperature of 827° and an evaporation of but 4.70 lbs. of water to 1 of coal. A new boiler was given this engine, having the same fire-box area as the old one, but an increase of 300 ft. in tube surface—a total heating surface of 920 ft. No other changes were made to the engine. With a freight train of 29 loaded cars and a speed of 14.52 miles per hour, and an average steam pressure of 128 lbs., the smoke-box temperature while using steam was 712°, being 115° less than with the old boiler and half the weight of train in the instance above referred to. The evaporation with the new boiler was 6.20 lbs. of water to 1 of coal.

As an instance of how a strong draft affects the temperature in the smoke-box, take freight engine No. 7, on the two tests over the same part of the road, with the same average weight of train (23½ loaded cars) and about the same speed, the difference being in the size of the exhaust nozzles only. On trip No. 1 the smoke-box temperature was 783° and steam pressure 117 lbs. The nozzles were then made ¼ in. larger, and on trip No. 2 the steam pressure averaged 114 lbs. and smoke-box temperature 721°, the speed of the train on the latter trip being 1.50 miles per hour greater than for the former.

Engine No. 30 with a fire-box surface of 77.5 ft. and tube surface of 616.5 ft., total 694 ft., with a train of 21 loaded cars, over the same part of the road, at a speed of 16.5 miles per hour averaged a steam pressure of 124 lbs. and a temperature in the smoke-box while using steam of 739°. Evaporation, 607 lbs. of water to 1 of coal.

Engine No. 22, of precisely the same dimensions as the No. 30, with a passenger train of five cars over the same part of the road using the same quality of coal, and run at an average speed of 33.1 miles per hour, showed an average steam pressure of 123 lbs. and smoke-box temperature of 797° while using steam. The same engine on the next trip over the road with four cars and a speed of 35.3 miles per hour showed an average steam pressure of 126 lbs. and smoke-box temperature of 779°. The smoke-box temperature of the engine with passenger trains was, in both cases, higher than that of the freight engine of the same class.

Passenger engine No. 4, with a fire-box surface of 81.5 ft. and tube surface of 719.5 ft. total, 801 ft., with a train of four cars, run over the same part of the road and using the

100 tubes of 2 in. outside diameter and 11 ft. long, we would have in this case a tube surface of about 521 ft., measuring the inside surface; the area of the holes (inside diameter) would be about 258 square inches. Now, if double the number of tubes of the same diameter and length be placed in this boiler, then the tube surface and the area of holes will be doubled, and the same volume of gases would have double the time in passing through, and, having double the time, more of the heat would be absorbed by the water, without in any way interfering with the draft or process of combustion in the fire-box. The draft of air into the fire-box should be better in the latter case than in the former, for the reason that the tube area is greater, and consequently less friction from an equal volume of gases passing through in a given time; and the influence of the exhaust in the smoke-stack would be more effectual in supplying air to the fire-box than in the case of the smaller number of tubes.

How much more of heat would be absorbed by the water by this increase of tube surface we do not know to a certainty. Neither is it known what proportion of the steam generated in the boiler is from a square foot of the fire-box surface and what from a foot of tube surface. These are matters which have never been determined in the case of a locomotive boiler, so far as your committee are aware, but which would be of value in determining the best proportions, if known. By doubling the tube surface, we would not, however, increase the value of that surface for evaporation in an equal degree, for the reason that as the temperature of the gases decreased by being longer in contact with the cooler surfaces, the difference in temperature would become less, and consequently the passage of heat from the one to the other would be slower, as in the case of the two pieces of metal referred to above, when the original difference between them was but 2°.

By largely increasing the number and area of the tubes, the draft through them would be correspondingly slower, and when not sufficiently strong to carry the cinders and small coals which should be lodged in them through into the smoke-box, some would stop up, and would cause more or less trouble and expense in keeping them clean. How much the tube area may be increased without getting to a point where its advantages will be counterbalanced by disadvantages, we of course are unable to determine. We believe, however, that, as a rule, locomotive boilers as proportioned in this country are deficient in heating surface, particularly so in the tube surface. We are led to this conclusion from the experiments we have made in the temperature of the gases after they have passed through the tubes and become waste heat. We find that when they are thrown away, so to speak, they still have a temperature of about 400° above that of the steam in the boiler, and it is to this waste of heat that we call the attention of master mechanics and others interested in the economical working of our locomotives.

The heat generated in the fire-box represents the cost of the fuel, and if any of it is wasted, it is equivalent to a proportionate waste in the purchase of the fuel.

It is not probable that any boiler can be adapted to the

will serve to indicate the general outlines of English boilers of recent design; the prevailing feature is extreme simplicity of form.

"The raised wagon-tops and the large domes which greatly weaken American boilers are now almost entirely abandoned in England. The alkali market will serve to indicate the general type of American boilers, though, in justice to the manufacturers, I will say they almost always recommend a simpler form than the one now unfortunately so popular. Within the last few years crown-bars have so frequently dispensed with in English practice, and the simpler form of staying with through bolts adopted. This plan, which was used by Henry Tyson twenty years ago on the Baltimore & Ohio, is still sometimes used in America, but not so frequently as its merits deserve.

"Brick arches are largely used in both English and American engines, but the deflecting plates above the fire doors, which are absolutely necessary to insure a proper combustion of smoke, though almost always used in England, are rarely seen here.

"In England the fire door is often made to open inward, so that the deflector is only in position when firing is going on.

“ In the construction of ash-pans and dampers, the English take great care to have a means of checking the draft to the fire. The ash-pan is made of plate at least  $\frac{1}{8}$  in. thick, and stiffened with angle iron to prevent warping, and the dampers are arranged to close air-tight, and are operated either by a lever and notch-plate or by a screw, so that the fireman can, by regulating the opening, control the steam, without recourse to the objectionable practice of opening the fire door.

"The superior economy in consumption of fuel by English engines cannot, of course, be all credited to the boiler. The valve gearing, the arrangement of cylinders, especially as regards the position of the steam and exhaust ports, and the great care taken in educating the engine-men are all important factors in the question of fuel consumption.

"That the English engines are very economical, an inspection of their fuel reports will show.

"Looking over a number of such reports in my possession, I note that on one line, with frequent grades of from one in fifty to one in two hundred, and hauling passenger trains equal in weight to seven American coaches, with stops at intervals of every three miles—engines with cylinders 16 by 24, and four wheels coupled, burn 35 lbs. per mile. Express engines on a level line making an average speed of 45 miles an hour, with train equal to six American cars, burn from 21 to 25 lbs. per mile.

"On another line with grades of one in fifty and one in one hundred, Express engines hauling trains equal to seven American coaches, at a speed of 47 miles per hour, burn 27 lbs. per mile, this being the average of a number of engines and not the best performance of one.

"Freight engines on the line last referred to haul 45 English wagons, probably equal to twenty-five of our loaded box-cars, consuming 45 lbs. per mile.



"Another line reports an average consumption of 35 lbs. per mile, with an average train of 55 wagons, the engine being 17 x 24 cylinders and six wheels coupled.

"On one line the express engines with sixteen cars, weighing ten tons each, burn 27 lbs. per mile; and on another railway, the express engines, with ten cars, burn 26 lbs., the speed in both cases being 45 miles per hour.

"The methods by which such economy is produced are well worth study, and it would be an interesting experiment if some American railway company would purchase an English engine of a type suited to its service, and ascertain by actual experiment if similar results are attainable in this country.

"Yours very respectfully,  
(Signed) "HOWARD FRY."

Your committee are under obligation to Messrs. Jacob Johann, James Sedgley, S. J. Hayes, Howard Fry, James M. Boon, William Fuller, C. A. Coolidge and others for valuable statistics and information furnished us, and which we present as a part of our report.

Respectfully submitted, (Signed)

R. WELLS,  
Jeffersonville, Madison & Indianapolis Railroad;  
C. R. PEDDLE,  
Terre Haute & Indianapolis Railroad;  
S. J. HAYES,  
Illinois Central Railroad;  
J. JOHANN,  
Wabash Railway;  
JOS. ECKFORD,  
Cincinnati, Hamilton & Dayton Railroad;  
Committee.

### Safety of Train and Yard-Men.

The following report was presented at the recent Convention of the Master Car-Builders' Association by the Committee appointed to communicate with train-men and yard-masters:

Mr. President and Members of the Master Car-Builders' Association:

GENTLEMEN: At the annual meeting of this Association in June last a committee was appointed to communicate with yard and train-men, to ascertain and report to this meeting if anything could be added to or omitted in the construction of freight cars, with a view to the better protection from injury of yard and train men in the performance of their respective duties.

In order to reach the parties directly interested your committee sent out over one hundred postal cards, asking for suggestions pertaining to draw-bars, dead-woods, steps, ladders, brake-wheels, running boards, etc. They were requested to state what, in their experience, they deemed the most common cause of injury to men in their vocations, and what, in their judgment, would remove or lessen the frequency of such accidents.

Quite a number of replies has been received to the above questions, and some valuable suggestions made. It is the desire of your committee that the suggestions made, coming as they do from the men who perform the hazardous work of coupling freight cars, etc., not only be heard by those who build and have charge of repairs to cars, but, as far as possible, be put into practice.

Before proceeding further with this report we will state that some of the parties replying have, we think, mistaken the mission of this committee. We did not consider ourselves an advertising medium, and therefore have abstained entirely from recommending any particular patented device.

#### DRAW-BARS.

Our first consideration will be the draw-bars. It is universally conceded that these should be of uniform height, or as nearly so as possible. The standard height, adopted in June, 1871, is 2 ft. 9 in.; yet freight cars have been built since that date the height of whose draw-bars will vary three inches from this standard. This lack of uniformity is considered by yard-men a common cause of injury to men. Master car-builders can have no excuse for this nonconformity to standard, when cars are built and repaired under their own supervision.

The fastening of the coupling pin into the draw-bar, so that it cannot be pulled entirely out, is considered by yard-men a serious defect, and is one of the causes of injury to men, and sometimes loss of life. They give their reason (we use their own language): "Switching cars the men go between them to pull the pin as far as it will come out; they place the pin in the notch made in it for that purpose, then go out from between the cars to give the engineer a signal to give them a 'kick'; the engineer opens his engine to give the cars a good start, and nine times out of ten, the pin will fall back before the cars are separated; the man goes between them again, following them up until he has succeeded in separating them. It is under such circumstances as these that men get caught in a frog or between guard-rails, and are frequently run over."

Instances are cited by several persons of accidents of this character having occurred.

A preference is given by these men to cast-iron draw-bars, with a large opening on the outer end, so as to readily admit the link. This very much facilitates coupling, and, by the use of a stick, the coupling link is easily steered into the other draw-bar.

#### DEAD-WOODS.

Within a few days we have noticed the double dead-woods on freight cars belonging to five different railway companies. The distances between the blocks measured as follows: 28 in., 25½ in., 17 in., 12½ in. and 11½ in. respectively. It can easily be seen that unless two cars come together whose blocks are placed a uniform distance apart, they are of no value in saving the springs, for which purpose they are intended. Imagine the jeopardy in which a man is placed who goes between two cars to make a coupling, when on one car the blocks are placed 28 in. between, and on the other car only 11½ in. And then some of these dead-woods are 15 in. up and down, and 17 in. between.

How is a man to make a coupling with such barriers placed before him, unless at the risk of his limbs?

There are but few railroad companies now who use the double dead-woods, but when two such cars come together, they are pretty sure to do injury to limb. Cases are cited where strong, robust men have gone between cars to make a coupling, and came out crippled, perhaps for life, caught between the dead-woods placed at each side of the draw-bars. Only last week a man on the Lake Shore & Michigan Southern Railway, while in the act of coupling, was caught between two Empire Line freight cars, and had his arm smashed. One man says that there is nothing about a car that gives a yard-master more courage than a good solid dead-wood, placed directly over the draw-bar. They are almost to a man, loud in their condemnation of the two blocks placed on each side of the draw-bars. "Man-killers" and "maimers" some of the yard-masters term them. It is cruel to a point of brutality that dead-woods on both sides of the draw-bars should be longer tolerated; and your committee hopes that the time may not be distant when all parties interested will become quickened to consciousness as to the necessity of the case, and order their removal as expeditiously as possible.

Now, gentlemen, pleading as some of the men have for the

removal of those instruments of torture, is it right to disregard their appeals?

#### STEPS AND LADDERS.

The general impression is that these are placed upon freight cars for the express purpose of reaching the top of the car from the ground, and the persons performing this kind of duty, we concede, should know best where to locate them. The prevailing opinion expressed is that the steps should be fastened to the side-sill and made sufficiently strong to bear the weight of a heavy man. These steps should not be less than 8 in. below the sills, and 12 in. wide in the clear. The location of the ladders as recommended by the yard-masters, is on each side of the car, at diagonal corners, near the ends, and these to be made preferably of iron, and to project 3½ in. from the side of the car. On the top of the car a handle should be firmly fastened, with a bend near one end of it. This is to keep in position the brakeman's lamp, while he is applying the brakes. In addition to the side ladders, two handles should be securely fastened, one near each corner, at each end of the car. These are for yard-men and others to hold on to with one hand, while the other hand is drawing the coupling-pin. Some persons have recommended that two handles, one above the other, be placed at each end of the car. These are to give a person an opportunity, while in the act of climbing, to change his position from the side to the end, should he see anything likely to strike him while on the side.

#### BRAKE-STAFFS AND BRAKE-WHEELS.

Most of the replies contain a recommendation to make the brake-staff somewhat longer than is now in use on some railroads, and place the ratchet-wheel on the roof of the freight cars, and not on a small platform fastened to the end at a distance below the roof. The latter is considered more dangerous should any of the parts of the brake apparatus give way. Besides, time is lost getting from the roof to this platform, and when a man gets there, he is in fear of a similar platform on the next car coming in contact with him and, perhaps breaking his leg, or the brake-wheel of the next car coming in contact with and taking the skin off his fingers. There is no good reason why this evil cannot be remedied, by simply lengthening the present brake-staff, and by putting the ratchet-wheel and pawl upon the roof. The holding of the brake-pawl firmly in its place is quite important; the giving way of this in some form or other, so as to render it inoperative, is much complained of, and often allows cars to come together with more force than is desirable.

Owing to the manner in which the work is done on some freight cars, should the brake-pawl be made ever so secure to the roof boards, there is danger of the roof boards themselves giving way. We saw, a few weeks ago, one-third of the roof boards loose and the balance not very securely fastened on—a few 8-penny nails being all that held the boards on. These are things that are dangerous in the dark to train-men.

Running boards are portions of freight-cars somewhat neglected, and may, perhaps, be considered by some as not of much importance. Many cars are running without any running boards on them, making it quite unsafe to travel over the roofs in slippery weather. Running-boards, in the opinion of your committee, should be from 18 in. to 24 in. wide; made of three widths of boards, not less than one inch thick, with a space of about one inch between each board. These should project over each end of the car about 5½ in., beyond the end boarding, or, perhaps, a little short of the face of the dead-woods. This reduces, by so much, the step from one car to the other end.

Gentlemen, your committee is in full sympathy with the men who make up and run freight trains, and as this committee was appointed to ascertain from those men, what, in their judgment, should be changed in the construction of freight cars, we therefore recommend to this convention, and to all parties having charge of car building and repairing:

1st. That special pains be taken to have the draw-bars on all freight equipment made 2 ft. 9 in. from top of rail to centre of mouth of the draw-bars; and that the draw-bars be so placed on the cars as to locate the coupling-pins not less than five inches from the centre to the face of the dead-wood.

2d. That the double dead-woods be discontinued from all freight cars, and that a solid block, 6 in. thick, placed directly over the draw-bar, be used in their place.

3d. That two good, substantial steps, made of wrought iron, ½ x 1½ in., be fastened, one to each side sill, at diagonal corners of the car.

4th. That each box and stock car have two ladders, not less than five steps in each ladder, made of ½ in. round iron, projecting 3½ in. from the siding, securely fastened to each end at diagonal corners, with a handle directly over the ladders, on the roof.

5th. That the small platform placed at one end of freight cars, to fasten the brake-pawl, etc., be discontinued, the ratchet-wheel and pawl to be fastened to a suitable casting on the roof.

6th. That the running-boards be not less than 18 in. wide and one inch thick, the ends to project 5½ in. outside of the boarding, the projections to be supported by two braces made of 1½ in. x 1½ in. iron.

As uniformity in the different parts of freight cars is such a desirable thing, your committee would suggest that the master car-builders will, as far as their authority extends, carry into practice the recommendations made by this committee.

Respectfully submitted,

JOHN KIRBY,

J. H. F. WIERS,

ANDREW STEINBRENNER,

} Committee.

This report was received and the recommendations adopted.

### Chipped Treads on Car Wheels.

At the first day's session of the late Convention of the Master Car-Builders' Association, the following question was submitted:

"Should chipped-tread wheels be classed as wheels broken under fair usage?"

The PRESIDENT explained that chipped-tread wheels were wheels with a piece broken out of the outside of the tread.

Mr. HOPKINS thought that if the wheel were otherwise sound and good and the chipping was not due to unsoundness, poor material or other defect chargeable to the maker, it must necessarily be considered that the chipping was a break under usage, and that the company breaking it was at fault.

Mr. KIRBY had always maintained that a broken tread was a thing that one company should pay another for, as it occurred in regular service. It was not like an accident; it occurred in regular service and should be paid for as a broken wheel. It was fair usage, inasmuch as it was not ordinary usage. Each company should pay for the wheel in that as in any other case.

Mr. ORTTON had been having some trouble with chipped wheels, and did not think it right that his company should pay for them. When his road received through cars going east there was barely time to inspect them, but when they got to Buffalo a thorough inspection was made, and if a

wheel was found chipped, it was laid to the last line running the car, though it might have been done on some other road. He thought it proper that each company should maintain its own wheels, and that a chipped wheel should be paid for the same as a broken wheel by the company owning the truck.

Mr. KIRBY asked whether broken treads were not found on all lines; perhaps on one as much as another. Some said that the road-master was careless and the track in poor condition; but he thought that, as each company ran its own cars over the road the frogs and crossings would be properly maintained, and therefore a chipped wheel should be classed as a broken wheel.

Mr. ORTTON proposed that it be definitely understood that a chipped wheel was broken under fair usage, and that the owner should pay for it. In this case it would not be necessary to take exceptional pains to find out on what road the wheel was chipped.

Mr. C. E. GAREY said that on most roads the wheels were guaranteed by the makers, and it was hardly to be supposed that any company would allow the track to be kept in such condition as to break the wheels. It did not seem that a company could afford to keep its track in such condition, and if a wheel was broken without running off the track he would call it broken in fair usage, and hold that the company owning it should pay for it. It must be a faulty wheel. There were few cases where a wheel would show a clean break without any flaw.

Mr. HAYES agreed that wheels proving defective and breaking should be paid for. Of course, if a car was run off the track, the road where the accident took place must pay.

Mr. ADAMS thought it was certainly to a company's interest to keep its frogs in good condition; if bad, they would break its own wheels as well as others. It would be a very difficult matter sometimes to trace a broken or chipped wheel. On a sleeping car, for instance, running over several roads, it would be impossible. It was best to leave the matter as it is.

Mr. HOPKINS said that some roads were grossly negligent in leaving bad frogs in the track. Their local trains ran over them at low speed, but through trains running at a high speed and chiefly made up of foreign cars would be very likely to break or chip wheels. When called to account they would say, "Why don't our wheels break? These foreigners are sending us poor wheels."

The PRESIDENT was prepared to say that 99 out of every 100 chipped-tread wheels were broken through the fault of trackmen. This being the case, they were not broken in fair usage. He had had a case himself during the past year. A large number of chipped treads being reported, the matter was referred to the Superintendent. The Roadmaster reported the track in good condition, but a careful examination found several defects in track that would cause chipping of treads. Roads had a right to leave track in a condition that would chip their own wheels if they chose, but he questioned their right to chip wheels belonging to others and then make them pay for it. It was evident that wheels were chipped through faults of track, and that being the case they should be paid for by the company on whose road they were chipped. If inspectors at points of interchange failed to discover such wheels, the road receiving them should be responsible for them.

Mr. ORTTON asked if there was any difference between a road that breaks a wheel in running and a road that chips the tread; and why the company owning the wheel should pay for it in one case and not in the other?

The PRESIDENT said that if the breaking of the plate of a wheel should be shown to be the result of a faulty track, the company owning the track ought to pay for it. He could not think of any instance where this was the case, however, while the chipped treads could be traced directly to faulty track, frogs, crossings and guard-rails. He was surprised that they should be so anxious to pay for wheels that others were certainly responsible for.

Mr. ORTTON did not say positively that they chipped no wheels; it was only a probability.

Mr. VERRYCK thought that the best way out was to take the Pennsylvania Railroad plan. They were responsible for a car until it was off their road, and would pay for a wheel broken in any way while on their road. This was the best way out of the difficulty.

Mr. KIRBY thought that this rule would make inspectors very strict, and would cause delay of freight.

Mr. FORD asked how far a wheel chipped in the tread would be safe to run. If they were to allow wheels to run with chipped treads, the question came up how far they were going to go.

Mr. KIRBY thought that wheels chipped in the tread were not safe to run. They should be removed. It made very little difference, from what he could learn, which company paid for them; they all had chipped wheels, and it came to about the same thing in the end. He thought a broken tread unsafe to run, because it would keep getting worse and worse.

Mr. C. E. GAREY asked whether most of the chipped wheels were broad or narrow tread. He had heard that broad-tread wheels were liable to chip from running over tracks worn by narrow treads.

The PRESIDENT said that last year most of the wheels chipped on his road were narrow treads.

Mr. ORTTON referred to his proposition that chipped-tread wheels should be considered broken under fair usage. He wished to withdraw that, as the rules for interchange of cars were to come up for settlement, and would cover the case.

This was agreed to, and it was decided that no action should be taken in the matter until the revised rules for interchange of cars came up for discussion.

### New York Legislative Investigation of Railroad Practices.

The Special Committee of the New York Assembly, appointed to investigate charges of railroad discrimination, resumed its sittings in New York July 9, pursuant to adjournment.

The first witness called was Traffic Manager Rutter, of the New York Central, his testimony being mainly the clearing up of points on which he was not prepared to answer at his previous examination. He testified that Central paid the Merchants' Despatch Company for car mileage in 1878 \$233,290.41. The total number of cars in service was 3,196. There was paid for commissions \$155,814.14. The commissions paid for two years ending April 30, 1879, were \$336,569.79. The amount of car earnings during the same time was \$455,110.26. The elevator at Sixtieth street cost \$504,601.92. For the year ending Sept. 30, 1878, the tonnage of freight from and beyond the western terminus of the road to New York and beyond was 1,551,782 tons, exclusive of live stock, oil and coal, and to and beyond Albany and Troy was 1,582,231 tons, with the same exclusions. The total tonnage for the fiscal year 1877-78 included live stock, 479,961 tons; oil, 423,850 tons, and coal, 846,908 tons. The tonnage from New York to and beyond the western terminus was 240,312 tons, and from Albany and Troy 205,755 tons. The company moved in all 7,424,218 tons of freight. It divides its traffic into way and through, calling the through traffic that passing



over the entire length of the line. Under this division the through traffic of passengers was 13% per cent., and the way traffic 98% per cent. It is impracticable to tell the exact amount paid the Central by the Standard Oil Company for carrying a barrel of oil, since there are many rebates and allowances. In three years, ending July 1, J. A. Bostwick received rebates amounting to \$30,772 on oil carried for him. The Standard Oil Company, \$47,801; the Acme Oil Company, \$66,639, and so on. On cattle during the three years E. C. Eastman and Eastman, Allerton & Co. received \$351,396.76 for care of cattle and for other services to the company. For charges on elevating grain the New York Central road paid its share of 46 per cent. on grain from Chicago and 38 per cent. on grain from St. Louis. From January, 1877, to June, 1879, both inclusive, it paid Whitney & Twombly and Mr. Twombly, since the death of Mr. Whitney, \$290,389.60. The firm paid \$447,783 rental.

Mr. Sterne then presented a schedule, showing the amount of municipal aid given to the railroads of the state, the total amount being stated at \$30,978,906, besides \$9,060,591 from the state direct.

A short discussion between Mr. Sterne and Mr. Depew followed, as to the fairness of this schedule.

Col. George T. Balch, formerly Inspector and General Storekeeper of the Erie was then called. His testimony was chiefly as to former reports made by that company to the State Engineer, in which it was charged that the floating debt had been repeatedly understated, and that other items were also stated in a manner calculated to mislead. Witness also stated that the cost of road as reported was very much greater than its real cost or value, and included a large amount for discounts on stock issued, and other items chargeable to mismanagement and dishonesty of past administrations. The present management had been careful to add to construction only such items as were fairly chargeable to that account, but had carried forward the total amount left by their predecessors. The witness also explained at length the methods adopted by him in making an inventory of the property, and ascertaining its true value.

## Contributions.

### The St. Louis Bridge.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of July 4, in an article on the significance of the change of the St. Louis, Iron Mountain & Southern Railway's gauge from five-foot to standard, you say: "The St. Louis Bridge toll, however, is the greatest obstacle to building up a Chicago-Texas business by way of St. Louis," and, further on, you point out how the business may be done by way of Cairo so as to "avoid the bridge."

You were pleased, on several former occasions, to "gazette," as it were, the St. Louis bridge tolls as extravagant, though why a paper, which is usually as impartial and circumspect as yours, should do so in regard to the tolls of the St. Louis Bridge any more than in regard to those of the Omaha, Louisville, Hannibal and other bridges, whose published tariff is in hardly any respect lower, though in many respects higher, is scarcely to be understood. The published tariffs of all these bridges must be known to you, but it may not be known to you that the St. Louis Bridge furnishes not merely the roadway, like the other bridges, but the motive power, the terminal facilities, the store-door delivery—in fact, all the services of a connecting railroad, all of which are included in the tolls. It must be also known to you that the published tariff of the St. Louis Bridge, or that of other bridges (except, perhaps, Omaha), is no more rigid and inflexible than that of the railroads. If you were to adduce our published tariff, low as it is, in support of your assertion that the St. Louis Bridge is a "great obstacle," to any railroad traffic you would be as far from the mark as if you were to take the published tariff of any existing railroad as indicating all its rates.

From my last annual report (herewith inclosed) you will perceive (page 5) that the average gross toll received per loaded car over the St. Louis bridge was \$4.20. Compared with the transfer charge at Cairo, which is 2 cents per cwt. over the Illinois Central transfer boats, and \$5 per car over those of other lines, it would appear that "Chicago-Texas" business would not gain much by the route which your article suggests, "to avoid the bridge." It might avoid the bridge, but not the toll.

I would remark, however, that the parties directly interested, to wit, the roads leading to and from St. Louis, including the Chicago-Texas roads, and railroad freight agents generally, know that for through business the St. Louis Bridge rate is not arbitrary, but that it always adjusts itself to the requirements of the traffic. They know that they have never applied for a rate over the St. Louis Bridge, such as was necessary to secure the business by this route, that was not readily given; and I take this opportunity to say that no Chicago-Texas, or any other business, shall be diverted from St. Louis by reason of the St. Louis Bridge toll. If it be simply a question of cost of transfer, the bridge will always make such rates as will take the business.

WM. TAUSIG, General Manager.

ST. LOUIS, July 7, 1879.

[We have certainly been mistaken in assuming that the St. Louis Bridge tolls were inflexible, and 5 cents per 100 lbs. on all freight in both directions, which probably is due to having seen the tolls mentioned only or chiefly in connection with west-bound rates when the latter were lowest, as in the recent quotations of rates to Missouri River points via St. Louis. But we protest that we never meant to intimate that the rates were extortionate, and we never should, until the profits of the bridge and tunnel are four or five times as great as they ever have been yet. Our sympathies are decidedly with the investors who put their money in that great work and are getting very little interest on it. The company is certainly justified in getting all

it can out of the traffic for which it has provided at so great expense.

That does not prevent the regular tolls from being a great obstacle to through traffic, and a much more striking one than tolls on most other bridges, for the reason that the traffic which crosses this bridge is mostly carried at trunk-line rates—on the average probably not one-half as much per ton per mile as Chicago-Kansas City or Chicago-Omaha rates. The reasonableness of a charge has nothing whatever to do with its effect on traffic. If it is more than by other routes, the business is pretty sure to be diverted to those routes, even if the charge does not pay expenses.

But for the erroneous impression, before mentioned, that the St. Louis bridge rates were inflexible, we certainly should have assumed that its rates would be reduced when necessary, to prevent the diversion of traffic—that it would take what it could get when it could not get what it wants and what it needs. Indeed, it was not easy to see how rational men could do otherwise. If \$10 per car-load is likely to turn freight over the Louisiana or Hannibal bridges, it is of course to the advantage of the St. Louis company to accept such other lower rate, provided it exceeds the cost of handling it, as will preserve the traffic. Mr. Tausig's explanation of the policy of the bridge indicates that it is managed rationally.

This bridge is certainly a great work and serves a most useful purpose; but it is the misfortune of its owners that it was enormously costly. For a considerable portion of its business it must compete with structures which cost less than a million, while it, before the recent reorganization, had a capital of more than twelve millions, and a yearly interest charge of more than half a million. It must charge all the traffic will bear in order to make even a slight profit on the investment.

We confess that we supposed that it had been unwise enough to charge more than the traffic would bear. The effect of the toll is felt on much more than the through business. It is an element in the expenses of the St. Louis merchant in his competition with Chicago merchants, amounting to 6% per cent. of the first-class and 12½ per cent. of the fourth-class rate from New York to Chicago, having the same effect on the latter as an additional distance of 120 miles. Doubtless by adjusting rates to circumstances in cases as they arise it can be prevented from diverting through traffic from the St. Louis routes.—EDITOR RAILROAD GAZETTE.]

## THE SCRAP HEAP.

### Railroad Equipment Notes.

The Missouri Car & Foundry Co. is turning out 108 car wheels a day in its foundry in St. Louis.

The street railway cars for the St. Thomas Street Railway, Ontario, were ordered of the Cleveland Bridge & Car Works on the 6th day of June, and on the 30th of June were delivered to the street railway company in St. Thomas. Considering the character of street-car construction, this is a remarkable performance, and we doubt if it was ever excelled.—*Cleveland Herald*, July 5.

The Allegheny Car & Transportation Co., at Swissvale, Pa., is running its works over time and employing a larger force than usual.

The firm of Thomas, May & Co., Indianapolis, has been dissolved by the withdrawal of Mr. John P. May. The remaining partners will continue the business under the firm name of J. Thomas & Sons.

Mr. J. M. Clark, at Howell, Mich., lately delivered a lot of hand-cars with sail attachment. He is now filling orders for hand-cars from two parties in New York, one order being for export.

The shops of the South Pacific Coast Railroad, at Newark, Cal., are building four new passenger cars.

The Danforth Locomotive Works, at Paterson, N. J., have contracted to build four consolidation engines for the Delaware, Lackawanna & Western road.

The Barnum & Richardson Manufacturing Co., in Chicago, is running its car-wheel foundry full time, with a number of orders on hand.

### Iron and Manufacturing Notes.

The rolling mill of E. & G. Brooke, at Birdsboro, Pa., is to be stopped about July 15, to be rebuilt and enlarged. Four new puddling furnaces, new boilers, a new engine and a new water-wheel will be put in and other improvements made.

A nut lock intended especially for rail-joints and invented by Mr. Mulconery, an engineer on the St. Louis, Alton & Terre Haute road, has been tested by several of the lines running into East St. Louis, and has been adopted by the Indianapolis & St. Louis.

The Kentucky Rolling mill, in Louisville, is to be started up soon, after a long stoppage. A new company has been organized.

The Ontario Rolling Mill, at Hamilton, Ont., started up last week, running on merchant bar.

It is said that Cleveland parties are negotiating for a lease of the large rolling mill at Wheatland, Pa., in the Shenango Valley.

Dilworth, Porter & Co., of Pittsburgh, have had to start up their puddling furnaces, on account of the scarcity and high price of old rails, which they have been using for some time.

### Bridge Notes.

The Pittsburgh Locomotive Works are building two iron bridges, one for the Pittsburgh, Cincinnati & St. Louis, and one for the Baltimore & Potomac road.

The contract for the suspended truss work on the East River Bridge between New York and Brooklyn has been awarded to the Edgemoor Iron Co., of Wilmington, Del., the material used to be Bessemer steel. By the terms of the resolution awarding the contract the Bridge Trustees are

not to be required to take more than 500 tons before Jan. 1, 1880, and no material is to be delivered between Jan. 1 and May 1, 1880, nor thereafter, until notice is given by the Trustees. Should such notice not be given by July 1, 1881, the contract may be declared no longer binding.

### Prices of Rails.

Steel rails continue firm, all the mills being full of orders. Quotations are \$45 per ton at mill for December, and \$43 to \$46 for summer delivery.

Iron rails are very firm, the mills are busy and it is difficult to place orders for delivery before September or October. Quotations are \$38 per ton at mill, a rise of about \$5 since January.

Old iron rails continue scarce and in demand. Sales are reported at \$23 to \$24.50 per ton on cars. Some importations are reported.

### Rotten Ties.

A conductor thinks it all a mistake to say that the American people are deteriorating physically. He says that, to see the absurdity of such an idea, one ought to travel a few days with him, and see the size and robust proportions of the children under 12 years of age that he is called upon to pass for half-fare. And their parents are ready to swear to it, too.

The post-office at Solitude, Posey County, Ind., has been discontinued. This is as it should be, for a post office in a Solitude must be unnecessary.

Underneath a freight car which came to this station from Port Jervis was found a bird's nest. It was found perched on a beam above the trucks and contained four bluish-green eggs.—*Hornell Times*

Apparently that car had not been earning much mileage lately.

It is a singular fact that, while we are often informed that the contractors on a new road are rushing down the track at the rate of a mile a day, it generally takes them a month to get from five to ten miles ahead.

### Hand-Cars with Sail Attachment.

Mr. J. M. Clark, of Howell, Mich., has lately built a lot of cars for a prairie road, with an arrangement for disconnecting the gearing and running by wind when it is favorable. After a trial of several weeks the cars have been pronounced perfectly satisfactory. In an ordinary, almost every-day breeze they can run 15 miles an hour under sail. On a road where the conditions are favorable a great saving of labor might be effected in this way.

### A Big Ferry Boat.

Work upon the Central Pacific Company's new monster ferry boat, the Solano, now building at West Oakland, has been pushed ahead so rapidly that it will soon be ready for launching. She is much longer even than the City of Peking, and has a greater width of beam than any vessel afloat. Her measurements are as follows: Length, 424 ft.; height of sides in centre, 18 ft. 5 in.; height at ends, 15 ft. 10 in.; width over guards, 116 ft. The Solano will have two vertical beam engines of 60 in. diameter and 11 ft. stroke, built by Harlan & Hollingsworth, Philadelphia. The wheels are 30 ft. in diameter, with buckets having a face of 17 ft. Eight steel boilers, each 28 ft. in length, will be provided, and will be made in pairs, with a smoke-stack to each pair. Four Pratt trusses give a longitudinal stiffness and connect the deck and bottom of the boat in true bridge style. She is a double-ender, and has four rudders at each end, worked by a hydraulic steering apparatus operated by an independent steam pump. By this improved method of steering, she can be handled by one man where ordinarily three would be required. The engines work independently, each moving one wheel, which will revolve independently of the other. The boilers are placed upon the deck to prevent the escaping steam from rotting the wood. The hold is divided into 11 water-tight compartments, which renders her less liable to sink, and also strengthens her. Four tracks will be placed upon her decks, which will accommodate 48 freight cars or 24 passenger coaches. Her slips will be provided with aprons 100 feet in length, which will admit of cars being taken aboard without uncoupling from the engine. The Solano is intended to run between Martinez and Benicia, where slips are being built for her. By this route the distance between this city and Sacramento will be but 85 miles, instead of 140 miles via Livermore and 151 via San Pablo. It is expected that upon her establishment on the ferry line the Vallejo route will be practically abandoned, only local business being done through it.—*San Francisco Evening Post*, July 1.

### The Tanner Brake Suits Again.

The Pittsburgh *Telegraph* of July 7 says: "Mr. S. D. Cozens, solicitor for Peter P. Parrott and others, as executors, etc., to-day filed in the United States Circuit Court bills in equity against the following railroad companies for improvement on railroad car brakes patented by Thompson and Batchelor in 1852, and assigned to Henry Tanner, of Buffalo, N. Y.: Allegheny Valley, Oil Creek & Allegheny River, Pittsburgh & Birmingham, Pittsburgh, Allegheny & Manchester, Federal Street & Pleasant Valley, Pittsburgh, Oakland & East Liberty, Citizens', Pennsylvania, and Pittsburgh, Cincinnati & St. Louis. When the patent expired, in 1866 to 1873, it is alleged that these roads used the brakes without paying any compensation for the privilege to Mr. Parrott, to whom an interest in the improvement had been transferred, and the bill is for damages for their use during those seven years. In the bill the brakes are described as being so constructed that they 'possessed and embodied such a mode of operation that all the brake shoes of the car were combined with each other and with the windlass or windlasses, or winch or winches of the car, by means of a vibrating lever or levers and rods and chains under the car body.' The Court issued a subpoena ad respondendum for each of the defendants."

### Riding on a Truck.

On the 18th the conductor on the evening train going from Detroit on the Grand Trunk discovered a small blaze of fire between two cars as the train was nearing New Haven. The conductor had the train stopped to investigate and found a poor crippled boy under the train enveloped in flames and fairly writhing in agony. The poor boy lived near Smith's Creek and said he was trying to get home from Detroit, where he had been for some time engaged in selling newspapers, but had no money, and so secreted himself on the axle under the car to escape observation. A spark from the locomotive had set his clothing on fire and his helpless condition rendered him unable to hang on and at the same time rid himself of his clothing. To let go his hold was to drop beneath the wheels and be crushed; so in his sad predicament he was literally roasted alive. The poor fellow was taken to New Haven and left in the care of the doctor, but died two days after. He gave his name as Laverne.—*Mt. Clemens (Mich.) Press*.

### Tramps.

The usual influx of so-called harvest hands, a large part of them really tramps, is reported at the West, and trainmen on freight trains in Illinois and Iowa are once more in a state of war, as it were, going armed and looking for a fight at any time.





Published Every Friday.

CONDUCTED BY

M. WRIGHT DUNNING AND M. N. FORNEY.

## CONTENTS.

ILLUSTRATIONS:	Page.	Page.
Twelve-wheel Connected Locomotive, Philadelphia & Reading Railroad.....	373	
Locomotive Boiler Diagrams.....	375	
CONTRIBUTIONS:		
The St. Louis Bridge.....	377	
EDITORIALS:		
Endurance of Locomotive Boilers.....	378	
The Rock Island Report.....	378	
The Adhesion of Locomotives.....	379	
American and British Engineering Societies.....	380	
Wabash, Kansas City & Pacific Railroad.....	380	
Record of New Railroad Construction.....	380	
GENERAL RAILROAD NEWS: Meetings and Announcements.....	381	
GENERAL RAILROAD NEWS: Elections and Appointments.....	381	
Personal.....	381	
Traffic and Earnings.....	381	
The Scrap Heap.....	377	
Old and New Roads.....	382	
ANNUAL REPORTS:		
Mobile & Girard.....	384	
Cincinnati, Hamilton & Dayton.....	384	
West Jersey.....	381	
MISCELLANEOUS:		
Boiler Construction.....	373	
Safety of Train and Yard-Men.....	376	
Chipped Treads on Car-Wheels.....	376	
New York Legislative Investigation of Railroad Practices.....	376	

## EDITORIAL ANNOUNCEMENTS.

**PASSES.**—All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.

**Addresses.**—Business letters should be addressed and drafts made payable to THE RAILROAD GAZETTE. Communications for the attention of the Editors should be addressed EDITOR RAILROAD GAZETTE.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN OPINIONS, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

## ENDURANCE OF LOCOMOTIVE BOILERS.

In the comments on this subject published last week attention was called to the fact that the chief difficulties now encountered in operating locomotive boilers are:

1. Incrustation.
2. Internal corrosion of the plates.
3. Injury to fire-box plates by the action of the fire.

With reference to the first, it was shown that there were indications in the report made by the Committee on Boiler Construction that material progress had been made, and that there was a good promise that some of the means proposed for purifying water would prove to be effectual. There can be very little doubt but that the second and third causes of deterioration in boilers are due very largely to the first, and it has been shown that on many roads where water is very pure the endurance of locomotive boilers is many times greater than on roads where the water used is very impure. A plate thickly coated with incrustation will not last as long as one which is clean, and the liability to injury from the effects of the fire is much greater if a plate is subject to being overheated than if the heat is rapidly conducted away by direct contact of the plate with the water.

The mysterious action of those forms of corrosion known as furrowing and pitting has, however, never been satisfactorily explained. Mr. Hayes, in his letter to the committee referred to, makes a suggestion as to the cause of these two forms of corrosion that seems to have much plausibility. After describing his device for catching lime and arrangements for washing out boilers, he says that when the lime is separated from the water, "the particles of earthy matter settle freely at the bottom of the cylinder part and leg of the boiler, from which places they

are easily removed by washing. At places on the line where there are no facilities for properly washing out boilers, and where the scale is allowed to accumulate until it becomes necessary to remove the flues for the purpose of cleaning the boiler, the sheets in the bottom of the cylinder part of the boilers rapidly waste away." Mr. Hayes suggests that this is due to "corrosion and the wear resulting from the movement back and forth from the motion of the water in the boiler and of the impurities which settle on the sheets." The theory that furrowing and pitting are caused by the mechanical action of the impurities in the water due to their motion or currents of the latter is, we believe, a new one. It seems, however, very plausible. Any person who has been at all observant, has noticed that in mountain streams with rocky beds it is no uncommon thing to find that a pebble or stone has worn for itself a cavity in the rock on which it rests simply by being kept constantly in motion in one place by a current of water, aided perhaps by the abrasion of sand. The action of the sand-blast is now familiar to all. A stream of sand carried by a rapid current of air against a plate of glass will cut entirely through it in a few seconds. It is probable that a stream of water mixed with sand if carried with a high velocity against a boiler plate would cut entirely through it in a few minutes. Of course the movement of the impurities and of the currents in a boiler are comparatively slow, but so is the action of furrowing and pitting. The latter is most liable to occur just above the mud-ring, which, it will be noticed, is the place where the direction of the currents of water caused by the heat in the fire-box is changed. That is, the current is upward next the inside fire-box plate and downward next that outside, so that the particles of sand, etc., contained in the water would impinge against the plates at the point where the downward current is changed to an upward direction. The impurities would naturally lodge in the corners and next to a lap-joint, and by being kept constantly in motion—like the pebble in the rocky stream—would abrade the boiler plate in an analogous way. Channeling always occurs at some point at which there is a corner and a place for impurities to be deposited, and where these are kept in constant agitation by the currents of water.

Pitting occurs chiefly at the bottom of the waist of the boiler, where the impurities lodge and where the currents and motion of the engine keep them in constant motion. It is quite conceivable that this produces an action analogous to that of a pebble in a rocky stream, and that the pitting may be due to the constant motion of particles of sand on the surface of the boiler plates.

Mr. Hayes gives some confirmatory testimony of this theory. He says:

"To protect these sheets against corrosion and the wear resulting from the movement back and forth from the motion of the water in the boiler of the impurities which settle on them, I have had lining plates of common iron about  $\frac{3}{8}$  of an inch in thickness and 36 in width fitted to the bottom of the shell and secured in position by  $\frac{1}{2}$  in. rivets placed 12 in. apart. These plates form no part of the structure of the boiler, but simply act as a protection to the sheets. Care is taken to have the edges of the plates fitted closely to the sheets of the boiler, and as an additional protection a heavy coating of paint is put on the inside of the shell under the plates before they are secured in position. Very good results have been obtained from their use. The wear and corrosion act on the plates instead of the sheets of the boiler."

If the pitting is due to chemical action it is hard to understand why it does not occur underneath these covered plates, because from Mr. Hayes' account it would seem that the space between the plates is not made water-tight.

If this theory be correct, pitting and furrowing are due, not to chemical action, but simply to mechanical abrasion of the plates by impurities contained in the water, and it would seem as though hard and gritty substances like sand and mud would be more active in producing this effect than lime in any of its combinations. The theory might be tested by practical observation of the conditions under which furrowing and pitting occur. If it be true that these are due to the presence of mud and sand, then it is plain that it is equally important to exclude these from boilers as to extract the lime from feed-water. The plan proposed last week is suggested as a means of doing this.

The destructive action of the fire on the fire-box plates is manifested in two ways, first by the wasting away of the plates on the fire side, and, second, by the cracking of the plates. Both of these are confined almost entirely to the inside fire-box plates. So long as metal plates are exposed to the action of a heat so intense as that in a locomotive fire-box, it will probably be impossible entirely to prevent them from being injured more or less. A sure cure of the evil, however, would be not to expose such plates to the heat of the fire. This is the remedy suggested by Mr. Verderber, whose method of constructing locomotive boilers was illustrated and described in the *Railroad Gazette*

of Feb. 28, 1879 (page 110). This is referred to by the Committee, and some comments thereon are published in their report. As it is made at present, a locomotive fire-box is one of the most expensive parts of the machine to construct and keep in repair. To dispense with it altogether, or, at least, with its most expensive features, would obviously be the most radical and effective reform. Of course this might be done and at the same time the cost of maintaining what is substituted for it might be so great as to offset entirely what has been displaced; or, while the original cost and the expense of maintaining the new device might be much less than the old form of fire-box, the cost of fuel might be increased so much as speedily to waste all the assumed saving. The committee considered both of these questions. They say that the evaporation of the Verderber boiler, 4.55 lbs. of water to one of coal, as reported by its inventor, "is a low average, and considerably below that of locomotive boilers of the usual form in this country." It must be remembered, though, that the committee are entirely ignorant of the quality of coal used, and while 4.55 lbs. might be a very low evaporation for American coal, it may be very high for Hungarian coal, which is known to be of very poor quality; so that, in judging of the efficiency of this boiler, they have formed an opinion on data of the nature of which they are probably quite ignorant.

The Committee further say: "A shell of boiler iron similar to that around the fire-box is required to hold the brick lining, and the fire-brick forming the lining will necessarily need renewing every few months." Now, it would be interesting to know why they have come to such a sweeping conclusion. Why would such a shell "necessarily" require renewal every few months? Like Dr. Johnson, when the loafer told him he "must live," we "don't see the necessity." It may be that it would burn out, as the Committee say; but they have given no evidence or good reasons for thinking that it would. It is also said in the report that "this, with the possibility of the lining burning out in the most exposed parts, at unexpected intervals, exposing the metal shell to injurious temperature, etc., are likely in the aggregate to give as much trouble and be as expensive as the common water-lined fire-box now in use."

Now, these conclusions are all pure conjecture. They may be confirmed by practice, it is true; but the committee have given no other reason for concluding that they will be, excepting that in a very loose way they think they will.

Attention has already been called to the importance of this improvement, if experience shows that it is entirely practicable. At one stroke it would dispense with the fire-box plates, stay-bolts, crown-bars, and the whole system of bracing now required to strengthen the boiler over the fire-box. The evils of cracked plates, broken stay-bolts and overheated crown-plates would be reformed out of existence, and a locomotive boiler would be reduced practically to a plain cylindrical boiler with tubes extending from one end to the other.

The experiments of Mr. Verderber have evidently been made with great pains, and the conclusions therefrom have been stated very cautiously; so it seems as if the subject had hardly received the attention which its importance deserves at the hands of the Master Mechanics' committee.

Briefly stated, then, the improvements which may reasonably be expected to be made in locomotive boiler construction are, first, effective means for extracting both lime and mud from feed-water; second, improved methods of washing out boilers similar to those described in the committee's report; third, substituting for the present form of fire-box one similar to that proposed by Mr. Verderber, so that corroded and cracked fire-box plates, broken stay-bolts, overheated crown-sheets and broken stays and braces may be reformed entirely out of existence. With such improvements the evils which have been described in the reports to the Master Mechanics' conventions year after year, and which are the source of so much trouble and expense, would disappear almost entirely, much to the profit of railroad companies and the advantage of all concerned.

## THE ROCK ISLAND REPORT.

The report of the Chicago, Rock Island & Pacific Railroad Company for the year ending with March last shows results which certainly ought to be satisfactory to the stockholders, if they are reasonable men. The profits of the company, after paying all fixed charges—interest and rentals—were equivalent to about 15 $\frac{1}{4}$  per cent. on the capital stock, which is doing very well for a Granger railroad. The amount divided from the earnings of the year was 10 per cent., the rate for six years previous having been 8 per cent.



This is almost the only road, of any extent, that has been able to increase its dividends since 1873. The progress made reflects credit on the productiveness of the country which the road serves, and on the skill and economy of the management; for the increase in profits is due partly to a great growth in freight traffic, and partly to a lower cost of carrying it. The growth of freight traffic is even greater than on other Western roads in its vicinity. It has been caused but in small part by increase of mileage, the Keokuk & Des Moines road having been worked only in the last half of the year, and the new branches, which cannot add much traffic yet, still later. But the tonnage-mileage was 38 per cent. greater in the last year than in 1877-78, 51 per cent. greater than in 1876-77, 77 per cent. greater than in 1875-76, and 104 per cent. greater than in 1873-74, which latter was a year of extraordinary productiveness. Yet the mileage varied only from 975 to 1,003 miles down to 1877, and the average worked in 1878-79 was but 1,125. Like the Chicago, Burlington & Quincy, this company's western lines reach Nebraska and Kansas; where growth of late years has been greatest, and has access to the country which supplies a large share of the wheat, corn, cattle and hogs that go to the Chicago market. The growth of the trans-Missouri country, as far north as the Union Pacific, brings growth to its traffic, though there is a considerable area south of the Platte in which it probably can not command nearly so much traffic as does the Chicago, Burlington & Quincy, through its closer relations with the railroads there. It is, however, more like this last-named road in situation and nature of traffic than any other line out of Chicago. Both have lines from Chicago to Council Bluffs, and both lines to the "Missouri River points" in Kansas. The Rock Island's Council Bluffs line is south of the Burlington for about half the distance across Illinois, and north of it in Iowa—generally its next neighbor in either state. There are coal mines on its line in both states, but it is not so much of a coal-carrier (that is, from the mines,) as either the Chicago & Alton or the Chicago, Burlington & Quincy, we believe. It has not nearly so many branches as the latter, and, in Illinois, does not reach so many large towns. In Illinois it has only one branch of any length, while the Burlington has nearly a score; but in Iowa the Rock Island has taken a great deal of pains to occupy the ground on both sides of it at least half way to the parallel roads on either side—the Burlington and the Northwestern—and between it and the former has completed a parallel line nearly half-way across the state. Its Kansas line, built for it by the Chicago & Southwestern Company, for most of the way in Missouri passes through a country quite thinly populated (considering its age) and slow of growth, not affording anything like the local traffic that the lines in Illinois and Iowa get. Its chief value so far has been as a Kansas connection, enabling the Rock Island to share in the large and rapidly-growing traffic that crosses the Missouri at Kansas City, Leavenworth, Atchison and St. Joseph—a traffic that is generally profitable, but sometimes not at all so.

Since the opening of this latter road the mileage worked by the Chicago, Rock Island & Pacific has been increased very little until last year, when additions amounting to 199 miles were made, though so late in the year that the average worked was but 93 miles greater than in the previous year.

The growth of the mileage and traffic of this company are shown below for seven years, previous to which it worked but little more than 600 miles:

Year ending May 31.	Miles worked.	Passenger-mileage.	Tonnage-mileage.	Equivalent to, over whole length daily each way.	
1873...	969	42,382,171	219,394,094	...	310
1874...	975	49,186,817	249,523,401	...	351
1875...	975	54,804,212	287,913,578	...	388
1876...	999	75,303,515	288,525,090	...	396
1877...	1,003	68,659,516	337,135,683	...	440
1878...	1,032	62,068,473	370,436,382	...	492
1879...	1,125	62,811,574	510,859,804	75	622

\* This does not include the passenger traffic on the 271 miles of the Chicago & Southwestern. In 1876-77 this was about 8,000,000 miles.

† This includes company and other non-paying freight, which amounted to 26,249,595 ton-miles in 1878-79 and 13,177,396 ton-miles in 1877-78.

The passenger traffic, as nearly as can be judged in the absence of the figures for the Chicago & Southwestern, has grown smaller rather than larger, of late years, but the growth in freight traffic has been steady; and since 1876 has been very rapid, and last year enormous. Reducing the traffic to the equivalent tons carried over the whole mileage worked both ways each day, shown in the last column, we find an increase of 28 per cent. from 1873 to 1876, of 24 per cent. from 1876 to 1878, and of 26½ per cent. from 1878 to 1879, the increase from 1873 to 1879 having been a little

more than 100 per cent., and from 1876 to 1879, 57 per cent.

Certainly, a road which doubles its freight traffic per mile of road in six years of universal dullness may be counted an improving property.

The gross and net earnings and surplus over fixed charges have been:

	Gross earnings.	Net earnings.	Surplus over fixed charges.
1873...	\$8,419,251*	\$2,901,448	\$1,804,778
1874...	7,048,203*	3,171,314	2,067,189
1875...	7,388,635*	3,532,305	2,427,305
1876...	7,342,190*	3,087,029	2,552,029
1877...	7,854,567	3,349,364	2,244,364
1878...	7,895,870	3,511,356	2,344,031
1879...	9,409,833	4,329,961	3,196,381

\* Not including Chicago & Southwestern. In 1876-77 this part of the system earned gross \$936,910, and net \$19,992. It probably had not earned its working expenses before, on the average, but its earnings were not reported, and the results can only be inferred by the charges made against the Chicago & Southwestern in the income account of the Chicago, Rock Island & Pacific.

The progress in gross earnings can be traced only for the past three years, for lack of the figures for the Chicago & Southwestern before that. Judging by its earnings in 1876-77, the gross receipts of last year were much the largest in the history of the road. The net earnings, though not including the Chicago & Southwestern before 1877, are probably fully as great as if they were included; for, down to that year the Rock Island had charged \$1,666,435 against that road for expenditures in addition to interest on the guaranteed bonds. The surplus over interest and rental (fixed charges) previous to 1878 does not take account of these expenditures, but only of the \$350,000 a year paid for interest in the Chicago and Southwestern bonds.

Since 1874, then, there does not seem to have been any increase in the profit of the company until last year, when they were nearly one third larger than ever before.

The great increase of the last year was doubtless exceptional; no company can hope to have its profits grow at that rate very often. It is of course quite probable that hereafter the profits will be less often than they are greater. Last year was one of extraordinary production in most of the country served by this road, and especially in Kansas and Nebraska. On the other hand, this trans-Missouri country has gained materially in population and in area cultivated since that time. But, when profits have become as large as this and the Burlington company made last year, growth of traffic is likely to be accompanied by such a reduction in rates received as to prevent an increase in profits. An increase, however, is not what the stockholders of the Rock Island Company ask for, probably. They will be fully satisfied if they continue to get 10 per cent.; and last year the surplus profits were one-half more than was required to provide such a dividend.

#### The Adhesion of a Locomotive.

A correspondent writes:

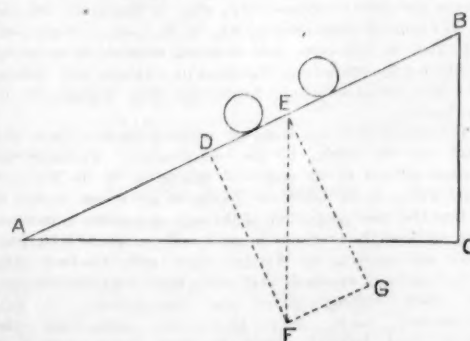
"We read yours in issue of June 6, 'How much can a locomotive pull?' but think it wants improvement, and that instead of multiplying the grade by a constant decimal only you should also have some constant figure to add in after multiplying.

"Example: Take (extreme case to test rule) locomotive with 12 tons (24,000 lbs.) on driving-wheels, 1,000 feet grade, speed slow, good rail, adhesion one fourth, and the engine will figure to haul itself and a little bit more, which we don't believe it can. We are, therefore, afraid the rule is not quite correct for, say, 200 to 400 feet grades.

"McClellan's rule, given in Haswell's book, by deducting the weight of engine comes nearer correct for impossible grades. Probably, both rules contemplate engines with, say, only two thirds of the weight on the driving-wheels."

It may be stated first that there was a slight numerical error in the calculation in the article referred to by our correspondent. The constant 0.3815 should have been 0.3788. The latter gives slightly less resistance on a grade than the former, but the difference is not material.

With the exception of this, we still believe the rule to be correct. The reason for it may be explained by the aid of the diagram as follows:



Let F represent a car on a grade, A B. Now, by the parallelogram of forces, if we draw the perpendicular

EF proportional to the weight of the car, and draw EG perpendicular and FG parallel to A B, then FG will be equal to the force which urges the car down the grade, and EG the force which presses against the rail. By well-known geometrical laws, the triangle EFG is proportional to ABC, in which AB = 1 mile or 5,280 ft., and BC the rise of the grade in that distance. Therefore, if we multiply the weight of the car by the rise in feet per mile = BC, and divide by 5,280 = AB, it will give the resistance of the car on the grade due to gravity alone. Now, if the grade is 1 ft. per mile, the resistance of 1 ton (of 2,000 lbs.) would be

$$\frac{2,000 \times 1}{5280} = 0.3788$$

For a grade of two feet per mile the resistance of each ton would be twice 0.3788, and for ten feet per mile ten times, etc. Hence, to shorten the calculation we gave the constant instead of the usual method of multiplying by the rise in feet per mile, dividing by 5,280.

Now, taking our correspondent's hypothetical case of an engine with 24,000 lbs. on driving-wheels. If this engine is of the ordinary American pattern, with tender, the total weight would be about 30 tons. The resistance of this on the grade named would be equal to  $(1,000 \times 0.3788 + 6) \times 30 = 11,544$  lbs. The adhesion of such an engine would be only about one-fourth of 24,000 = 6,000 lbs., so, evidently, it would not pull itself up the grade. If, however, it were a tank engine, with all its weight on the driving-wheels, then the resistance would be equal to  $(1,000 \times 0.3788 + 6) \times 12 = 4,617.6$ . As the adhesion is 6,000 lbs., "it would pull itself up and a little more besides," if the rails were in good condition and the size of cylinders and steam pressure sufficient to turn the wheels.

McClellan's rule, referred to by our correspondent, is identical with the one we gave, excepting that he uses tons of 2,240 lbs., so that his constant becomes 0.4242 instead of 0.3788; and he takes the adhesion at one-fifth the weight on the driving-wheels instead of one-fourth. He also adds 8 lbs. instead of 6 for the resistance per ton on a straight and level track.

If extreme accuracy is desired, some deduction must be made owing to the fact that, on a grade, the whole weight on the driving-wheels does not act on the rails to produce adhesion, but a part of it exerts a force to push the locomotive in a direction parallel to the rails. Thus, let A B in the figure represent a grade, and B C its vertical height per mile. Let E represent an engine on that grade which will be supposed to have a weight of 20 tons. Now, by the law of the parallelogram of forces, as explained above, if we draw a line EF perpendicular to the horizontal line A C, and to a scale so that its length E F will be equal to the weight on the driving-wheels, and make it the diagonal of a parallelogram, E D F G, whose sides are parallel and perpendicular to A B, then the length of the line E G perpendicular to A B will represent the proportion of the weight which acts against the rails at right angles to produce adhesion, and FG = D E = the force which tends to push the engine down the grade. To determine the proportion of the weight of a locomotive which acts on a grade against the rails to produce adhesion, we must therefore calculate the length of the base E G of a right-angled triangle whose hypotenuse is equal to the weight on the driving-wheels. The triangle E F G being similar to A B C of which A B = 1 mile and B C is the rise per mile of the grade, the proportion or component E G of the weight on the driving-wheels, which acts to produce adhesion, is proportional to the base A C of the triangle A B C, and the whole weight is proportional to the hypotenuse A B = 1 mile. If, then, we multiply the weight on the driving-wheels by A C, and divide by A B, it will give the part of the weight which acts to produce adhesion on a grade. The method of finding A C is to deduct the square of B C from the square of A B, and the square root of the remainder will be the length A C.

The calculation, however, becomes much simpler if we use trigonometry. By the latter, A C is proportional to the cosine of the angle B A C, and B C to the sine, so that simply multiplying the weight on the driving-wheels by the cosine of B A C will give the weight which acts to produce adhesion on the grade. The simplest way to get the cosine of the angle is to divide the height B C = rise in feet per mile, by the hypotenuse A B = 1 mile = 5,280 feet, which will give the sine of the angle B A C, from which the cosine may readily be found from a table of natural sines.

The following table, which has been calculated, will show, however, that the difference between the actual and effective adhesive weight is so extremely small that, excepting on very steep grades, it may be en-



tirely disregarded. Even on a grade of 1,000 ft. per mile the difference is less than 2 per cent.

Rise of grade in feet per mile.	Cosine of angle of grade with horizontal line.	Weight per ton of 2,000 lbs. on driving wheels which produces adhesion on grade.
50	0.99999	1,999 lbs.
100	0.99980	1,998 "
200	0.99928	1,998 "
300	0.99839	1,996 "
400	0.99712	1,994 "
500	0.99551	1,991 "
1,000	0.98190	1,963 "

#### American and British Engineering Societies.

The following table, showing the comparative strength, pecuniary and numerical, of the British Institution of Civil Engineers and the American Society of Civil Engineers, was presented at the recent convention of the latter society, and suggests some interesting comparisons. We may add to the data of the table that the British Institution was founded in 1828, and the American Society about 1857. The British Institution, moreover, contains a much larger proportion of mechanical and mining engineers than the American Society.

Comparison of British and American Engineering Societies.	
	British.
No. of members, 1878.....	2,815
Average attendance, 1878.....	274
Corporation fund.....	\$139,615
Trust fund for prizes.....	\$7,530
Total funds.....	212,645
Annual income.....	51,050
" per member.....	18.84
Working expenses.....	24,925
" per member.....	8.84
Cost of publications.....	24,765
" per member.....	8.80
Premiums and prizes.....	1,935
Total expenses.....	51,925

#### Growth of Membership.

Year.	British Institution.	American Society.	American Mining Engineers.
1869.....	1,580	160	.....
1870.....	1,703	192	.....
1871.....	1,786	220	80
1872.....	1,929	317	201
1873.....	1,994	414	271
1874.....	2,130	445	332
1875.....	2,284	492	431
1876.....	2,460	532	612
1877.....	2,611	573	600
1878.....	2,815	593	740

The contrast is in many respects sufficiently striking. The British Institution in 1869 had nearly 1,600 members. The American Society, which had been for many years before in semi-comatose condition, then had but one-tenth as many. Since that date the British Institution has increased its membership to 2,815, an increase of 1,226, or over 75 per cent., while the American Society, with the whole body of the profession to draw upon, has added only 433 members. This is not so very bad a showing by itself, for the class from which members are drawn is certainly not two-thirds as large, and perhaps only half as large in the United States as in Great Britain; but the latter part of the table appears to indicate that while the British Institution still has a vigorous growth, the American Society has reached something very like its limit of usefulness. The former increased 531 members, or 23½ per cent. in the last three years of the table, while the American Society increased only 101, or 20½ per cent. The last year reported shows still worse for the American Society, namely, only 3½ per cent. increase, against 8 per cent.

One cause for this effect is visible in the average attendance at stated meetings. The British Institution gathers together once a week the very respectable average of 274 members, or nearly 10 per cent. of all on its rolls. The American Society manages twice a month to get together twenty of its members, or 3½ per cent. Another marked difference between the two societies lies in the heavy prize-fund of the British Institution, which enables it to compensate its able or more zealous members with both money and honor for the labor and time required to prepare valuable papers. Nearly \$2,000 per year are disbursed in this way by the British Institution, and it is easy to see that this is likely to have a powerful effect in maintaining its transactions at a high standard. Another, and still more necessary condition, is that the presentation of a paper to the Society shall furnish the best possible method of reaching all those who have or may have an interest in its subject-matter. Very full abstracts, at least, of papers presented to the British Institution are regularly given in foreign technical periodicals, a practice which the American Society has, up to this time, systematically discouraged. We are glad to learn that this suicidal policy, more worthy of the middle ages than the nineteenth century, was formally abandoned by an apparently unanimous and enthusiastic vote at the late convention; the proposition to that effect having been greeted with clapping of hands from all parts of the hall.

The great and fundamental cause, however, for the languid growth of the American Society is, we take it, about as follows: The British Institution is so organized as to be well adapted to the conditions in which it finds itself; the American Society, although closely copied from the British, is not adapted to the conditions of permanent success in this country. One-seventh of the population of Great Britain, and probably a fifth or a sixth of British engineers, are concentrated at London, while all but a few engineers are as near to it as Boston or Baltimore to New York, and none but the foreign members are so far away as Buffalo. It follows that a purely local institution has sufficient members and influence to draw the entire profession to itself and truly represent it. The "American" Society, on the contrary, although its name is as broad as the continent, is

in the main a local institution; and this is more particularly and strikingly true in respect to its *live* membership, so to speak. Any one who will examine a file of the Society's publications will be surprised to find that the score or two of local members who make up the "average attendance" (even at the last "annual meeting" in New York there were only 42 members present) fill nearly as large a space in the *Transactions* of the Society as all the remaining 573. The difficulty lies not so much in the vast distances of this country—as is often carelessly argued, giving chance for the obvious reply that the railroad and the printing press have largely neutralized all that—as in the lack of any single point where the number of resident engineers is overwhelmingly greater than at any other point. It requires a very great difference in this respect to give any purely local society national strength, and the "American" Society cannot too soon recognize this fact by reorganizing itself in such manner that the two national societies shall bear closer analogy to their respective national governments than to each other. A single Parliament governs Britain successfully; thirty-eight parliaments, joined by a common bond, are essential for the different conditions of this country. So it is in engineering matters. Local engineering societies have already sprung up in Chicago, St. Louis, Boston, Philadelphia and San Francisco, which are restricting the growth and influence of the "American" Society. Others are sure to be organized, and sure to detract more or less from the strength of all the others; but if it were possible to join them all under a common constitution, such societies would be organized far sooner, flourish far better and each would add, instead of detracting from, the strength of the others. Especially is this true in respect to their scientific publications, the vitality and value of which would be in very nearly direct ratio to the number of readers reached by them. Still further to increase the latter, it would seem sound policy that the publications of the Society should be open to public subscription, and not be made, as now, a perquisite of membership, from the very mistaken idea that the inducements thereto are thus increased. Men join such societies from professional pride and *esprit du corps*, to strengthen their individual reputation and standing, and the chance of reading the transactions has very little or nothing to do with it. The money received from public subscriptions, moreover, and the more general interest awakened, would be a great help to the Society; but if there were no other argument this ought to be sufficient: restrictions upon the dissemination of knowledge, in any manner or for any purpose, are contrary to public policy and unworthy of scientific men; and any society which attempts or connives at them will be likely to suffer thereby.

#### The Wabash, Kansas City & Pacific Railroad.

The consolidation of the Wabash Railway with the St. Louis, Kansas City & Northern is announced. Taken in connection with the construction of a Chicago outlet for the Wabash, this is one of the most important events in railroad history that has occurred of late years. Heretofore there has been no railroad crossing the Mississippi south of the Chicago & Alton—no company which owned lines on both sides of the Mississippi. All the roads which reach St. Louis terminate there; none passes through it. All the roads west of St. Louis have had an interest in securing as much business as possible to go to or through that city. But now one of the principal roads of St. Louis will have, as it were, three eastern termini—St. Louis, Chicago and Toledo, and for a large part of its traffic the two latter termini can be reached, with saving of distance and cost, without passing through St. Louis. It will at once become to its interest to secure shipments to Chicago and Toledo rather than to St. Louis, because it will make sure of a longer haul on it if it goes to the more eastern termini. For instance, from Kansas City the distance by the new Wabash, St. Louis & Pacific will be 277 miles to St. Louis, about 500 to Chicago, and (by way of Hannibal) about 695 miles to Toledo. It is a decided advantage to a road to be able to accept freight for any places to which it may want to go, but this can be and is done without consolidation. Only a road which can carry to any of two or three places is not likely to make special efforts or rebates to turn the traffic to one place rather than another. We can imagine, for instance, that when grain is going from Kansas City chiefly to Chicago and Toledo, the St. Louis, Kansas City & Northern does what it can to get it to go to St. Louis, or by way of St. Louis, by which the distance to Chicago will be about 13 per cent. longer to Chicago and 8 per cent. longer to Toledo than by way of Hannibal, and this because it can get a haul of but 130 miles on shipments by way of Hannibal, but one of 277 miles on shipments by way of St. Louis. When consolidated, it will have just as much interest in securing traffic for the roads from Hannibal to Chicago and Toledo as it now has in securing it for the line from Kansas City to St. Louis.

It is not easy to see, however, whether the two roads will gain, on the whole, by the consolidation. Probably the largest portion of the eastward shipments of the Missouri road will go to St. Louis or Chicago in any event, though it is true that the proportion of through shipments is increasing, and that the tendency in grain and provisions is to eliminate all handling at Western cities after the first sale. It is commonly assumed that when there is a consolidation, or other uniting under one management, of two connecting roads, they give each other all the traffic that formerly went to rival roads, and that this is clear gain to them and loss to their rivals. This is very far indeed from the truth. Usually the consoli-

dated roads cannot afford to ignore wholly the roads with which they have been in the habit of interchanging traffic. One of the Pennsylvania's roads to Chicago delivers a great deal more of the freight that it receives at Chicago to the Erie than to the Pennsylvania Railroad; and the Michigan Central and the Lake Shore last winter delivered only about two-thirds of their freight to the New York Central, though more than a fourth of their shipments were consigned to New England points which can be most conveniently reached by the New York Central. We know that when Mr. Vanderbilt acquired the Canada Southern it was assumed that all the Michigan Central traffic would be given to it; yet the Great Western, the great rival of the Canada Southern, has had more than half of it.

The fact is, a road which receives traffic from another usually has something to give in return. It is a matter of reciprocity; and if one makes an exclusive alliance with one of several rival roads, it must expect the lines so excluded to send all the traffic they can to its rivals. When the Wabash and the St. Louis, Kansas City & Northern are united, the consolidated road will be a competitor of the Missouri Pacific and the Hannibal & St. Joseph in Kansas City and other "Missouri River points." The two former roads, we may be sure, will not give their traffic to their rival, if they can help it, after it leaves their roads at Hannibal or St. Louis, but will prefer to work in connection with other roads to the East that do not compete with them. So, while the Wabash may secure all the through shipments of the St. Louis, Kansas City & Northern, which now it gets but a part of, it will also lose the traffic which it now gets from the rivals of the St. Louis, Kansas City & Northern. Whether the gain will be greater than the loss cannot be known without knowing the quantities of traffic which each road supplies.

Newspapers and many investors persistently neglect this fact, and schemes for tying together a lot of non-paying roads is talked of as if it were sure to result in a vast increase of profits. Frequently there are great advantages in consolidation, but usually this is not one of them. Two strong roads combined make a strong company, and two weak ones combined make a weak company, unless the combining roads have been competitors and engaged in letting each other's blood.

In this case the two roads are connecting and not competing lines, and their interests were not often likely to conflict. They can hardly be called strong companies, as neither pays dividends, and the Wabash has recently been reorganized after some years of inability to pay all the interest on its funded debt. The latter is none the less a great road, carrying a very large traffic, and commanding a large share of the business of a wide belt through the most fertile part of Indiana and Illinois. It is, however, by reason of its situation, compelled to accept lower average rates on freight than almost any other railroad in the West—last year less than either of the trunk lines, and only half as much as the Rock Island received. Nearly everywhere it must compete with railroads which carry to the lakes by shorter routes, so that it is virtually compelled to compete with the lakes—which is pretty hard for a railroad—and the competing points are so near together that local rates cannot be kept much higher, for any considerable traffic, than through rates. Its future depends very much on the course of through rates. Growth of traffic will not help it much, unless it gets more for carrying than it had last year.

The contrary is the case with the St. Louis, Kansas City & Northern: it usually gets remunerative rates, but it wants more traffic. The country on its line grows but slowly, but it is one of the chief outlets for the trade of Kansas and the country further west, which has grown rapidly of late. It is now making an extension to Omaha, through a country which hitherto has insisted on sending its products chiefly to Chicago. The new road for some distance will not be badly crowded by older lines, and may be fully supported by local traffic; but we do not anticipate a heavy business for it. There will be more, doubtless, with an outlet at Hannibal, than if the business were all compelled to go to St. Louis, which never has been able to maintain very close relations with the country further north than the Hannibal & St. Joseph Railroad.

#### Record of New Railroad Construction.

This number of the *Railroad Gazette* contains information of the laying of track on new railroads as follows:

**Cotton Plant.**—Extended from Saulsburg, Ark., to Cotton Plant, 3 miles. It is of 3 ft. 6 in. gauge.

**Mont Alto.**—Extended from Nunnery, Pa., to Waynesboro, 3 miles.

**Cincinnati Southern.**—On the northern end track has been extended from Sloan Valley, Ky., southward to Burnt Field Viaduct, 12 miles; on the southern end extended from Dayton, Tenn., north by east to Rockwood, 40 miles, making 52 miles extension in all.

**Atchison, Topeka & Santa Fe.**—The Kansas City, Emporia & Southern Branch is completed from Emporia, Kan., south to Eureka, 47 miles. The New Mexico & Southern Pacific line is extended from Cimarron Crossing, N. M., southward to Las Vegas, 77 miles.

**Salina & Southwestern.**—Track laid from Salina, Kan., southward to Lindsborg, 20 miles. It is a branch of the Kansas Pacific.

**St. Louis, Keokuk & Northwestern.**—Extended south by east to Dardenne, Mo., 20 miles.

**St. Louis, Kansas City & Northern.**—Track laid on the Omaha Extension from Pattonsburg, Mo., northward 25 miles.

This is a total of 247 miles of new railroad, making 1,008



miles thus far this year, against 691 miles reported for the corresponding period in 1878, 689 in 1877, 740 in 1876, 426 in 1875, 690 in 1874 and 1,518 in 1873.

## General Railroad News.

### MEETINGS AND ANNOUNCEMENTS.

#### Meetings.

Meetings will be held as follows:  
*Pittsburgh, Virginia & Charleston*, special meeting, in Pittsburgh, July 14, to authorize increase of capital stock, and to approve the canceling of the present mortgage and the execution of a new one.

#### Dividends.

Dividends have been declared as follows:  
*Houston*, 2 per cent., quarterly, on the preferred stock, payable July 15.  
*Rome & Clinton*, 3 1/4 per cent., semi-annual.

#### Mail Service Extensions.

Mail service has been ordered over railroad lines as follows:  
*Cotton Plant Railroad*, service ordered from Brinkley, Ark., to Cotton Plant, 11.06 miles.

#### Foreclosure Sales.

The *Manhattan & Northwestern* road was sold June 30, under an order of the United States District Court, and bid in by E. B. Purcell, formerly Treasurer of the company, in the interest of the bondholders, for the sum of \$62,000. The company was chartered in 1871, with a purely local organization, to build a road along the Big Blue River from Manhattan, Kan., to the Nebraska state line in the Otoe Reservation, a distance of about 65 miles, with a branch to the Republican Valley, about 30 miles. Individual subscriptions and municipal aid to the amount of \$240,000 were expended on the line in surveying the entire route, and in obtaining right of way, grading, bridging and tying 33 miles complete. In the panic of 1873 work was suspended, but in 1874 seven miles of the line, beginning at Manhattan, were laid with 50-lb. rails. The company was, however, so badly crippled financially that the road was never put in operation, and in 1876 Mr. L. R. Elliott, President of the company, was appointed Receiver, practically leaving the road in the hands of the company. The sale does not change the ownership, but, as soon as it is confirmed, a new organization will be made with the needed capital, and the road will be built to a connection with the Burlington & Missouri River in Nebraska, at Beatrice.

The *Chicago, Pekin & Southwestern* road was sold under a decree of foreclosure in Chicago, June 30, and bought for \$750,000 by G. W. Cothran, Attorney for the Trustees. The road is 94 miles long from Pekin, Ill., to Mazon, where it connects with the Chicago & Illinois River road. Its bonded debt was \$1,000,000.

The *Delaware Shore* road was offered for sale in Woodbury, N. J., June 28, under a decree of the New Jersey Court of Chancery. Only one bid was received, \$101,000, and this being \$9,000 less than the appraised limit, the sale was adjourned for four weeks, until July 26.

The sale of the *Peoria & Springfield* road has been indefinitely postponed by a writ of *supersedeas* from the Illinois Appellate Court, pending hearing of an appeal from the decree of sale.

### ELECTIONS AND APPOINTMENTS.

*Adirondack*.—Mr. C. E. Durkee, long General Ticket Agent, has been appointed Superintendent, in place of Charles H. Ballard, deceased.

*Belfast & Moosehead Lake*.—At the annual meeting in Belfast, Me., July 2, the following directors were chosen: Charles B. Hazeltine, John Brooks, Josiah Mitchell, Daniel Faunce, William M. Woods, Philo Hersey, Edward Johnson, William H. Burrill, Samuel Otis. The board elected Charles B. Hazeltine, President; John H. Quimby, Clerk; Asa Faunce, Treasurer. The road is leased to the Maine Central.

*Chicago & Block Coal*.—The first board of directors is as follows: W. K. Alricks, A. T. Beach, Andrew J. Dull, Henry McCormick, N. R. Miller, Frank W. Morrison, D. Waltz.

*Chicago & Evanston*.—The first board of directors is as follows: S. Crane, J. H. Gage, A. H. Glaspell, W. McDonald, G. G. Pope, H. Pratt, C. M. Reynolds.

*Chicago & Indiana Southern*.—The officers of this company are: President, John Lee; Vice-President, David Turner; Secretary, James Ball; Treasurer, John Brown. The residence of the President is at Crawfordsville and of the other officers at Crown Point, Indiana.

*Chicago, St. Louis & New Orleans*.—The following changes in the Operating Department took effect July 6, 1879:

That portion of the road heretofore known as the Louisiana Division will be hereafter known and designated as the South Division, W. P. McKinley, Division Superintendent, in charge, with headquarters at McComb City. His jurisdiction will extend from New Orleans to, and include, the Canton station and yard.

The divisions heretofore known as the Tennessee & Kentucky Division, and the Mississippi Division will be consolidated, and hereafter known and designated as the North Division. Capt. John G. Mann, Division Superintendent, in charge, with headquarters at Jackson, Tenn. His jurisdiction will extend from Canton to Cairo, Ill. John S. McKay, is assigned to duty on the North Division, as Assistant Division Superintendent. He will report to and receive instructions from the Superintendent of the North Division.

All persons employed on the North Division will be subject to such rules as the Superintendent of the South Division may establish for conducting the movement of trains in the Canton yard.

*Chicago & Strawn*.—The first board of directors is as follows: William Reddick, Ottawa, Ill.; George L. Dunlap, John N. Jewett, Perry H. Smith, Chicago; Robert Andrews, Toledo, O. The company is controlled by the Wabash.

*Frankfort & Kokomo*.—Mr. J. P. Hale has been chosen Vice-President, in place of H. Y. Morrison.

*Greenville & Columbia*.—The officers are now as follows: James Connor, Receiver; Thomas Dodamead, General Superintendent; C. H. Manson, Treasurer; Thomas M. Barker, Auditor; Jabez Norton, Jr., General Ticket Agent; A. J. Dodamead, Assistant Superintendent. Offices at Columbia, S. C.

*Havana, Rantoul & Eastern*.—Mr. Winfield S. Matthis has been appointed General Freight and Ticket Agent, with office at Rantoul, Ill.

*Indianapolis, Decatur & Springfield*.—Mr. George A. Sanderson has been appointed General Freight and Ticket

Agent of this company, to take effect July 1, in place of Chas. V. Lewis, resigned.

*Kansas Central*.—Mr. John Iverson has been appointed Master Mechanic and Road-Master. He was formerly on the Missouri River, Ft. Scott & Gulf.

*Kansas City Air Line*.—The first board of directors is as follows: Andrew Simpson, Taylorville, Ill.; N. A. Eddy, Lincoln, Ill.; John W. Bunn, E. F. Leonard, Springfield, Ill.; H. C. Moore, St. Louis.

*Louisville, New Albany & Chicago*.—Mr. A. B. Southard, General Freight Agent, is appointed General Ticket Agent also, in place of E. T. Brooks, resigned.

*Metropolitan Elevated*.—At the annual meeting in New York, July 2, the old board was re-elected as follows: William R. Garrison, John Baird, William Foster, Jr., George M. Pullman, Horace Porter, José F. De Navarro, George J. Forrest, William Adams, Jr., John Q. Kennedy, Fausto Moran, Charles H. Clayton. The board elected Wm. R. Garrison, President; John Baird, First Vice-President and General Manager; Wm. Foster, Jr., Second Vice-President; John E. Body, Secretary and Treasurer.

*Mobile & Girard*.—At the annual meeting in Columbus, Ga., July 2, the following directors were re-elected: Wm. M. Wadley, Savannah, Ga.; R. L. Mott, H. H. Epping, John Peabody, L. T. Downing, Columbus, Ga.; N. P. Banks, Gentryton, Ala.; J. D. Murphree, Troy, Ala. The board re-elected Wm. M. Wadley, President; W. L. Clark, Superintendent; J. M. Frazer, Secretary and Treasurer.

*National*.—The directors of this new Indiana company are: Isaac B. Hymer, Johnson N. Burdge, John H. Shively, David T. Krisler, North Manchester, Ind.; Varnum J. Carroll, Calvin C. Miller, Warsaw, Ind.; Stewart Hymer, Terre Haute, Ind.

*New York Loan & Improvement Co.*—At the annual meeting in New York, July 8, the following directors were chosen: George M. Pullman, José F. De Navarro, John Baird, William R. Garrison, A. M. Billings, Horace Porter, George J. Forrest, John J. McCook, William Adams, Jr. This is the company which built and owns the Metropolitan Elevated road.

*New York & Long Island Bridge*.—At the annual meeting in New York, July 1, the following directors were chosen: William Stinson, Charles H. Rogers, Archibald M. Bliss, John T. Conover, Charles A. Trowbridge, Henry G. Smith, H. C. Poppenhusen, Edward J. Woolsey, Charles F. Tretbar, Gottlieb Gunther, Herman Funke, Thomas Rainey, Robert M. C. Graham.

*Paulling & Cecil*.—At the annual meeting in Paulling, O., July 7, the following directors were chosen: Col. S. R. Matt, C. L. Noble, Isaiah Richards, George W. Potter, A. V. Simpson, George W. Cox, M. N. Utley. The board elected George W. Potter, President; C. L. Noble, Secretary; Isaiah Richards, Treasurer. Mr. Potter succeeds Col. Matt, as President.

*Pennsylvania Railroad in Maryland*.—At the annual meeting in Cumberland, Md., last week the following directors were chosen: F. M. Brackett, A. J. Clarke, F. H. Haley, F. Laing, Jr., Henry Loveridge, J. M. Schley, J. F. Zacharias. The board elected James M. Schley, President; Henry Loveridge, Vice-President and Treasurer.

One stockholder seceded and elected the following directors on his own account: Nelson Bull, F. Haley, M. A. Healey, J. A. Hayden, Malcolm Sinclair, T. J. Wailes, W. W. Wiley.

*Pittsburgh, Titusville & Buffalo*.—At a meeting of the board of directors held June 30, Mr. John K. Wallace was elected Treasurer of this company in place of Mr. J. W. Moffly, resigned. Mr. Wm. Henderson is appointed auditor in place of Mr. W. T. Howe, resigned.

*St. Louis, Hannibal & Keokuk*.—Mr. N. B. Consigny has been chosen Secretary and Auditor in place of L. P. Jackson.

*Shore Line*.—At the annual meeting in New Haven, Conn., June 25, the following directors were chosen: S. B. Chittenden, Samuel Hemmingsway, Edward Ingraham, Charles Lenden, Ezekiel H. Trowbridge, Henry L. Hotchkiss, Wilbur F. Day. The board elected S. B. Chittenden, President; Samuel Hemmingsway, Vice-President; Wilbur F. Day, Secretary and Treasurer. The road is leased to the New York, New Haven & Hartford.

*Walkill Valley*.—Mr. J. H. Jones, Superintendent, is acting as General Freight and Ticket Agent also, in place of E. A. Jaques, resigned.

*Winchester & Strasburg*.—At the annual meeting in Baltimore last week the following were chosen: President, John King, Jr.; Directors, John Gregg, George A. Hupp, J. A. Sherrard, Hugh Sison, Thomas Whitridge. The road is leased to the Baltimore & Ohio.

### PERSONAL.

—J. E. Duff, Secretary and Auditor of the Eureka & Palisade Company, is reported a defaulter and has fled to Honolulu. His books are being examined and the amount of loss has not yet been ascertained.

—Mr. E. T. Brooks has resigned his position as General Ticket Agent of the Louisville, New Albany & Chicago road.

—Mr. Samuel Parsons, Division Engineer on the Texas & St. Louis road, died in Texarkana, Tex., June 10. He was an Englishman, and had held his position but a short time.

—Mr. M. A. Healey, late President of the Pennsylvania Railroad in Maryland, died suddenly in Cumberland, Md., July 8, aged 37 years. Mr. Healey, at the recent annual meeting, seceded and attempted to elect a second board of directors. His death will probably end this trouble, as he had no considerable following.

—Mr. William Cramp, head of the famous ship-building firm of William Cramp & Sons, of Philadelphia, died of paralysis July 6, at his summer residence in Atlantic City, N. J. He was 72 years old and had been a ship-builder from early youth. He leaves a large fortune, chiefly invested in his business.

### TRAFFIC AND EARNINGS.

#### St. Louis Bridge Rates.

The schedule of the St. Louis Bridge & Tunnel Railroad, which went into effect May 1, gives the following rates:

General merchandise, west-bound, to St. Louis proper (all classes), 5 cents per 100 lbs. The same going through St. Louis in either direction, if way-billed in car-load, from points of shipment, 4 cents per 100 lbs. Package freight, less than car-load, passing through in either direction, 5 cents per 100 lbs. The three upper classes of freight east-bound from St. Louis, 5 cents per 100 lbs.; the fourth class, 4 cents.

These rates include all charges for city delivery within the limits established by the St. Louis Transfer Company, and to all connecting lines.

For car-loads, loaded or delivered on track at Union Depot, or switched to connecting lines the charges are \$4 and \$5 per car-load, the lower rate including grain in transit, or to and from elevators, coal, coke, pig iron, railroad iron, brick, furniture, hay, ore, salt, etc. Lumber, live stock and many other articles pay \$5.

### Railroad Earnings.

Earnings for various periods are reported as follows:

Six months ending June 30:

	1879.	1878.	Inc. or Dec.	P. c.
Atchison, Topeka, & Santa Fe.....	\$2,772,474	\$1,510,265	I. \$1,262,209	83.6
Bur. Cedar Rapids & Nor.....	653,824	703,531	D. 139,707	17.6
Central Pacific.....	7,750,730	7,834,105	D. 83,375	1.1
Chicago & Alton.....	2,178,912	2,003,855	I. 175,057	8.7
Chi., Mil. & St. Paul.....	4,035,000	4,256,003	D. 221,003	4.7
Chi., St. Paul & Minneapolis.....	510,005	436,485	I. 84,420	19.8
Gal., Houston & Henderson.....	216,928	169,925	I. 47,003	27.6
Grand Trunk.....	4,137,128	4,350,177	D. 193,049	4.4
Great Western.....	2,037,702	2,246,100	D. 208,398	9.3
Hannibal & St. Joe.....	851,549	832,078	I. 19,471	2.1
Ill. Cent., Ill. lines.....	2,508,862	2,573,590	D. 64,728	2.5
" " Iowa lines.....	676,026	703,936	D. 117,910	14.9
Kansas Pacific.....	1,962,192	1,435,074	I. 526,218	36.6
Mo., Kan. & Texas.....	1,242,812	1,253,759	D. 12,947	1.0
Mobile & Ohio.....	845,360	935,034	D. 89,674	9.7
St. Louis, Iron Mt. & Southern.....	1,930,584	1,869,217	I. 61,367	3.3
St. Louis, Kan. City & Northern.....	1,509,090	1,510,095	D. 996	0.1
Scioto Valley.....	145,035	117,705	I. 27,330	23.2
Toledo, Peoria & Warsaw.....	574,367	613,042	D. 38,675	6.3
Wabash.....	1,050,289	2,187,300	D. 2,187,300	10.1

Five months ending May 30:

Houston & Texas Central.....	\$1,038,876	\$901,553	I. \$137,323	15.2
Net earnings.....	317,007	147,721	I. 169,286	114.7
N. Y., Lake Erie & Western.....	6,442,099	5,872,678	I. 569,421	9.7
Phila. & Reading.....	5,351,653	4,171,760	I. 1,179,897	28.3
St. Paul & Sioux City.....	247,581	238,379	I. 9,202	3.9
Sioux City & St. Paul.....	131,149	149,759	D. 18,610	12.4
Southern Minnesota.....	212,537	320,350	D. 107,812	33.7

Four months ending April 30:

New York, Lake Erie & Western.....	\$5,084,000	\$4,699,717	I. \$384,282	8.2
Net earnings.....	1,278,531	1,217,952	I. 60,579	5.0
Month of April:				
New York, Lake Erie & Western.....	\$1,372,755	\$1,127,079	I. \$245,676	21.7
Net earnings.....	408,300	235,324	I. 172,976	73.5

Month of May:

Atlantic & Great Western.....	\$319,013	\$287,417	I. \$31,596	11.0
Houston & Texas Central.....	165,551	138,863	I. 26,688	19.2
New York, Lake Erie & Western.....	1,358,000	1,172,961	I. 185,039	15.8
Phila. & Reading.....	1,332,547	1,286,014	I. 46,533	3.6
St. Paul & Sioux City.....	55,414	58,131	D. 2,717	4.7
Sioux City & St. Paul.....	30,170	33,215	D. 3,045	9.0
Southern Minnesota.....	50,140	81,769	D. 31,629	38.7

Month of June:

Atchison, Topeka & Santa Fe.....	\$399,500	\$346,489	I. \$150,019	61.3
Bur., Cedar Rap. & Nor.....	110,179	101,015	I. 9,164	9.1
Central Pacific.....	1,377,000	1,393,851	D. 16,851	1.2
Chicago & Alton.....	442,794	359,457	I. 83,337	23.2
Chicago & Eastern Ill.....	66,315	56,494	I. 9,821	17.4
Chi., Mil. & St. Paul.....	790,000	696,476	I. 103,524	25.5
Chicago, St. Paul & Minn.....	91,625	64,397	I. 27,228	42.3
Gal., Houston & Henderson.....	27,093	22,011	I. 5,082	25.8
Hannibal & St. Joe.....	100,989	137,454	D. 36,465	26.5
Illinois Central, Ill. lines.....	438,636	430,873	I. 7,763	1.8
Illinois Central, Iowa lines.....	116,086	121,833	D. 5,747	4.7
Kansas Pacific.....	373,176	223,522	I. 149,654	67.0
Mo., Kan. & Tex.....	221,892	207,514	I. 14,378	6.9
Mobile & Ohio.....	90,408	60,341	I. 30,067	33.3
St. Louis, Iron Mt. & So.....	283,300	254,740	I. 28,561	11.2
St. Louis, Kan. City & Nor.....	180,746	205,733	D. 24,987	12.1
Scioto Valley.....	28,258	27,576	I. 682	2.5
Toledo, Peoria & Warsaw.....	80,224	76,887	I. 12,337	16.0
Wabash.....	300,431	300,572	D. 141	0.0
Week ending June 27:				
Great Western.....	\$76,465	\$79,050	D. \$2,585	3.3
Week ending June 28:				
Grand Trunk.....	\$150,822	\$165,794	D. \$14,972	9.0

### Grain Movement.

For the weeks ending July 1 and July 8 (Tuesday), receipts and shipments at Chicago and Milwaukee are reported as follows:

	Week to July 1.		Week to July 8.	
	Receipts.	Shipments.	Receipts.	Shipments.
Chicago .....	2,783,287	2,007,020	2,234,908	2,374,723
Milwaukee.....	529,200	430,000	238,800	154,480

For the same week, receipts and shipments at Buffalo were:

For the same week, receipts and shipments at Buffalo were:

	—Week to July 1.—		—Week to July 8.—	
	Receipts.	Shipments.	Receipts.	Shipments.
By rail.....	712,000	913,550	534,000	854,163
By water.....	1,517,615	704,518	1,884,353	1,637,997
Total.....	2,229,615	1,618,068	2,418,353	1,892,160

For the week ending July 1, 32 per cent. of the receipts this year were by rail against 23 per cent. last; and 56 per cent. of the shipments, against 33 1/2 last year.

For the following week 22 per cent. of the receipts and 45 per cent. of the shipments were by rail.

For the three weeks ending July 8, receipts at the four leading Atlantic ports were:

	Week ending—		
	June 24.	July 1.	July 8.
New York.....	2,331,072	2,411,477	1,864,908
Philadelphia.....	1,203,800	752,470	421,400
Baltimore.....	1,130,305	637,893	671,200
Boston.....	577,272	307,425	310,220
Total.....	5,242,449	4,409,365	3,267,735

The receipts of the last week are exceptionally small for this year, but still a little larger than for the corresponding week last year. New York received 44.4 per cent. of the total in the week ending June 24, 54 per cent. in the week ending July 1, and 57 per cent. in the week ending July 8. The percentage of its receipts that arrived by rail were, for each week, 68, 69 and 59 per cent., respectively.

San Francisco wheat exports for June were nine cargoes, 579,817 bushels. For the California crop year ending June,



30, the exports were: 1878-79, 16,609,313 bushels; 1877-78, 6,855,952 bushels; increase, 10,853,361 bushels, or 163.6 per cent.

#### St. Louis Live Stock Pool.

A dispatch from St. Louis, July 9, says: "The decision of the arbitrators in regard to the percentages of the five roads in the Eastern Live Stock Pool was received to-day. The arbitration is in regard to the division of tonnage. The apportionment is: Vandallia, 22 per cent.; Indianapolis & St. Louis, 22 per cent.; Wabash, 22 per cent.; Chicago & Alton, 22 per cent.; Ohio and Mississippi, 12 per cent. Isaac H. Knox is made Commissioner."

#### Coal Movement.

Tonnages reported for the five months ending June 28 are as follows, the tonnage in each case being only that originating on the line to which it is credited:

Anthracite:	1879.	1878.	Inc. or Dec.	P. c.
Philadelphia & Reading.....	3,391,549	2,089,742	1,301,807	62.3
No. Central, Shamokin Div., and Summit Branch R. R.....	382,721	298,278	84,443	28.3
Sunbury, Hazleton & Wilkesbarre.....	12,580	12,005	575	4.8
Pennsylvania Canal.....	148,912	114,382	34,530	30.1
Central of N. J., Lehigh Div.....	1,790,524	956,045	804,479	84.1
Lehigh Valley.....	1,070,132	1,420,768	549,364	38.7
Penn. & New York.....	15,123	13,096	2,027	15.4
Del., Lackawanna & Western.....	1,074,440	888,185	186,255	20.9
Del. & Hudson Canal Co.....	1,475,466	899,492	575,974	64.0
Pennsylvania Coal Co. State Line & Sullivan.....	658,598	350,737	307,861	87.8
Total anthracite.....	11,514,503	7,058,288	4,456,215	63.1
Semi-bituminous:				
Cumberland, Balt. & Ohio R. R.....	429,423	394,926	34,497	8.8
Cumberland, Ches. & Ohio Canal.....	197,654	206,444	8,790	4.3
Cumberland, Bedford Div., P. R. R.....	79,850	47,283	32,567	68.9
Huntingdon & Broad Top.....	69,627	68,316	1,311	1.9
East Broad Top.....	33,736	30,784	2,952	9.6
Tyone & Clearfield.....	716,093	569,488	146,605	25.8
Belleville & Snow Shoe.....	23,145	12,824	10,321	80.6
Total semi-bituminous.....	1,549,408	1,360,065	189,343	14.0
Bituminous:				
Barclay.....	171,589	148,951	22,638	15.2
Allegheny Region, Pa. R. R.....	90,288	94,795	4,507	4.7
Penn and Westmoreland.....	372,763	337,332	35,431	10.5
West Penna. R. R.....	96,966	93,436	3,530	3.8
Southwest Penn. R. R.....	10,235	12,558	2,323	22.7
Pittsburgh Region, Pa. R. R.....	220,323	206,274	14,049	6.8
Total bituminous.....	971,164	883,346	87,818	8.7
Coke:				
Allegheny Region, Pa. R. R.....	26,306	.....	.....	.....
Penn and Westmoreland.....	53,608	32,393	21,215	66.1
West Penna. R. R.....	51,005	38,740	12,265	31.7
Southwest Penn. R. R.....	437,229	367,613	69,616	18.9
Pittsburgh Region, Pa. R. R.....	79,184	43,611	35,573	81.6
Total coke.....	647,822	482,357	165,465	34.3

Actual tonnage passing over the Huntingdon & Broad Top road for the six months was as follows:

	1879.	1878.	Increase.	P. c.
Broad Top coal.....	69,627	68,316	1,311	1.9
Cumberland coal.....	88,912	51,186	37,726	73.7
Total.....	158,539	119,502	39,037	32.7

The anthracite tonnage of the Belvidere Division, Pennsylvania Railroad, for the six months ending June 28 was as follows:

	1879.	1878.	Inc. or Dec.	P. c.
Coal Port for shipment.....	4,520	1,320	3,200	242.9
So. Amboy for shipment.....	231,063	236,398	5,335	2.2
Local distribution on N. J. lines.....	162,866	79,540	83,326	104.8
Company's use on N. J. lines.....	40,924	39,324	1,600	4.1
Total.....	439,373	356,582	82,791	23.2

Of the total this year 340,455 tons were from the Lehigh, and 98,954 tons from the Wyoming Region.

Actual tonnage of anthracite passing over the Pennsylvania & New York road for the seven months of its fiscal year from Dec. 1 to June 28 was: 1879, 484,802; 1878, 375,912; increase, 108,890 tons, or 29 per cent.

#### OLD AND NEW ROADS.

**Atchison, Colorado & Pacific.**—The Central Branch, Union Pacific Company, which has been building extensions and branches in Kansas under various organizations, has consolidated them all into one company under the above name. Meetings have been held of all the companies concerned and have ratified the agreement of consolidation, which is now complete. The companies included in the consolidation are the Waterville & Washington, the Republican Valley, the Atchison, Solomon Valley & Denver, and the Atchison & Denver. The new company owns all the Central Branch lines, present and projected, except the 100 miles from Atchison to Waterville. It is entirely controlled by the Central Branch Company, and it is understood that the two companies will be consolidated as soon as the necessary authority can be secured. This will require an act of Congress, as an amendment of the Central Branch charter.

**Atchison, Topeka & Santa Fe.**—The work of track-laying on the Kansas City, Emporia & Southern Branch was completed last week and trains begin running regularly this week. It leaves the main line at Emporia 112 miles from Atchison, and runs nearly due south to Eureka, 47 miles. It passes through a fertile country, already quite well settled and fast filling up.

On the New Mexico & Southern Pacific line the track last week reached Las Vegas, N. M., 77 miles beyond the late terminus at Cimarron Crossing, 144 miles southward from Trinidad, and 224 miles from the junction with the main line at La Junta, Col. The work on the Raton Tunnel is progressing well, and it is hoped that communication will be opened through in a few weeks.

**Atchison, Topeka & Santa Fe and the Denver & Rio Grande.**—A dispatch from Denver, Col., July 3, says: "In the United States Circuit Court this morning, Justice Miller decided that the Receiver for the Rio Grande Company had been properly appointed in the foreclosure suit begun in the state court by L. H. Meyer, and that the state court had the right to appoint the Receiver. The right of Meyer to have the Receiver appointed rests upon the fact that the mortgage was made years before the Santa Fe

Company had anything to do with the road. The conclusion was that the receivership must stand.

"In the Grand Cañon case it was decided that the Rio Grande Company must pay for the construction of the road in those parts of the cañon which were too narrow for more than one track, to which the Rio Grande Company had prior right under the decision of the Supreme Court, and the mandate for possession could not be executed until this matter had been settled."

Another dispatch of July 5 says: "In the United States Court this morning, the Santa Fe counsel gave notice of a motion to dismiss Receiver Risley, and have the Denver & Rio Grande property restored to the lessees. Then outcropped the fact that the Rio Grande counsel had not complied with the filing of their amended bill making the Santa Fe Company a party to the suit, which was promised last Thursday by the counsel. The court was indignant at this seeming attempt of the Rio Grande people to delay progress. Judge Miller gave the Rio Grande counsel until Monday morning for the filing of the same, under penalty of dismissal of their case. The court also sustained the exceptions of the Santa Fe counsel to the Rio Grande answer in one of the supplemental bills, the ruling being if the contract entered into between the two companies constituted an act of abandonment of the right through Grand Cañon, it was not material whether the contract had been fully lived up to or not. The Judge this afternoon suggested to the counsel of both companies that a commission of three competent engineers should be appointed, one by each company, and one by the court, to examine the Grand Cañon, reporting thereon as to how much of the cañon is too narrow for more than one track, and consequently how much of the Rio Grande is extended under a prior right."

**Atlantic & Great Western.**—A dispatch from Akron, O., July 9, says: "In the Summit County Common Pleas Court to-day, Judge Tibbals made the order asked by the Franco-Egyptian Paris Bank and others in interest for the sale of the Atlantic & Great Western Railroad, but not before February next. He also overruled the objection that the consolidated mortgage bonds were issued by the Trustees just after reorganization, holding that the presumption is that no road could have a sufficient accumulation from its earnings to pay cash for the great line purchased, and hence the issuing of mortgage bonds would be an inevitable step. The attorneys for Messrs. Bischoffsheim & Goldsmith, of London, expect that point to be argued hereafter."

**Avoca, Macedonia & Southwestern.**—This company is organized to build a branch of the Chicago, Rock Island & Pacific from Avoca, Ia., southward about 25 miles to Macedonia.

**Boston, Barre & Gardner.**—This company, as already noted, paid at the rate of only 5 per cent. instead of 7 on the last coupon on its first-mortgage bonds, and 3 instead of 7 on the second-mortgage, the directors stating that this was the best that could be done. The bondholders are not satisfied, however, and a meeting has been called to consider what can be done to protect their interests.

**Burlington & Missouri River in Nebraska.**—This company is making arrangements to build a pontoon bridge over the Missouri River at Plattsmouth. It is to be ready for use in the fall.

**Burlington & Northwestern.**—Contracts have been let for the extension of this road from Winfield, Ia., northwest to Washington, about 18 miles. The grading is to be done by Oct. 15, and the purchase of iron and ties has been authorized.

**Central of New Jersey.**—During the 24 hours ending at 6 p. m. of July 4, there were dispatched from the Jersey City depot of this road 105 passenger trains, and 97 others arrived, making 202 trains handled, or an average of 8½ per hour. Of course at certain hours of the day the number per hour was much greater, very few going out or arriving between midnight and 6 a. m. This includes the trains for the Main Line, the New York & Philadelphia New Line, the Long Branch Division and the Newark Branch.

**Central Vermont.**—A reduction of 10 per cent. in the wages of almost all classes of employés was ordered July 1.

**Centerville, Moravia & Albia.**—This road is to run from the Missouri, Iowa and Nebraska at Centerville, Ia., northward to Albia, about 25 miles. One town on the line has already voted a 3 per cent. tax in aid of the road, and others are asked to do the same.

**Chicago & Lake Huron.**—The Detroit Post and Tribune says: "It is understood that the bondholders of the Chicago & Lake Huron road are about to file a bill in the United States Circuit Court in this city to test the validity of the certificates issued by the receivers. The sale of the road has not yet been confirmed, as it could not be within 30 days, except by the consent of all the parties in interest. None of the certificates would be paid until the sale had been confirmed. The filing of the bill will operate to prevent the payment of any of the certificates until their validity has been passed upon by the court."

**Chicago & Strawn.**—This company has filed articles of incorporation in Illinois to build a railroad from Strawn, on the Chicago & Paducah road, north by east through Livingston, Kanakakee and Will counties to Bremen on the Rock Island road. The distance is about 80 miles, and the capital stock is to be \$700,000. This is the much-discussed extension of the Chicago & Paducah to Chicago in the interest of the Wabash company.

We understand the entrance into Chicago will not be made over the Rock Island road, as was the intention when the Decatur & State Line road was surveyed (which was over nearly the same route), but by another route.

**Cincinnati Southern.**—Steady progress has been made lately with the work of track-laying on this road. On the northern end the rails are down as far as Burnt Field Viaduct, Ky., 27 miles south of Somerset, 12 miles beyond the late terminus at Sloan Valley, and 185 miles from Cincinnati. Progress on this end has been delayed by the bridge-work and some grading which had to be finished.

On the southern end the track is now laid from Boyce's Station, Tenn., the junction with the Western & Atlantic road, five miles from Chattanooga, north by east to Rockwood, about 70 miles. This is 40 miles beyond Dayton, the last point reported. This leaves a gap of less than 100 miles, on most of which there is very little to be done except the track-laying and some bridge-work.

The Cincinnati Company, which now works the road under lease from the Trustees, reports an increasing business, and is making preparations for the extension of its operations, which will be made necessary by the completion of the road. The Cincinnati Railroad Company, operating this road, will receive sealed proposals until noon of Aug. 1, for 325 box cars; 50 stock cars; 100 coal cars; 125 platform cars; 6 eight-wheel caboose and 12 four-wheel caboose cars, all to be built to specifications which can be had on application. Proposals can be made for the whole or any por-

tion (not less than 50) of the above cars. Delivery to be made not later than Dec. 1, a deduction at the rate of 8 per cent. per year to be made from contract price for each day's delay in delivery. Terms of payment, cash on delivery and acceptance of the cars. Proposals must be sealed, indorsed "Proposals for Freight Cars" and addressed to W. H. Clement, General Manager, No. 82 West Third street, Cincinnati, O.

**Clarksburg, Weston & Glenville.**—Track on this road is now laid from the Baltimore & Ohio, at Clarksburg, W. Va., south to Turtletown, five miles. Work is progressing toward Weston.

**Columbus, Chicago & Indiana Central.**—Notice is given to all first-mortgage bondholders who have not subscribed or may decline to subscribe to the bondholders' agreement, that they must appear before Wm. P. Fishback, Master, for the purpose of proving their bonds. The Master will be at the office of Everts, Southmayd & Choate in New York, Aug. 25, 26 and 27, and at his office in Indianapolis Sept. 1 to Sept. 6, for the purpose of receiving proofs and also of hearing objections to the agreement, if bondholders desire to present them.

**Cotton Plant.**—This road is now completed to Cotton Plant, Ark., three miles beyond the late terminus at Saultsburg, and 11 miles from the junction with the Memphis & Little Rock at Brinkley. The road is of 3 ft. 6 in. gauge, and is owned by Gunn & Black, lumber manufacturers.

**Eastern.**—The rental due July 1 on the Portsmouth & Dover road was not paid, and committees from both companies are negotiating, the Eastern desiring to reduce the rental. The amount now paid is 6 per cent. on \$800,000 stock, which is about \$4,800 per mile yearly, the road being 11 miles long.

**Eastern, of Long Island.**—This company has begun work on a section of its proposed line from the New York & Manhattan Beach road at East New York to Jamaica, about 5½ miles. In order to get across the Long Island tracks at East New York the company secured the right to use the track of the Canarsie road for a short distance, but the Receiver of the Long Island Railroad refuses to allow the laying of a third rail at the crossing, claiming that the contract allowing the Canarsie road to cross does not authorize it to extend the privilege to another road. The residents along the line are also seeking to enjoin the company from building on its proposed route, which is directly along a public highway.

**Evansville, Washington & Worthington.**—The people of Evansville, Ind., have voted to subscribe \$150,000 to the stock of this company, to aid in the building of its road from Evansville north by east to Washington, about 55 miles. This subscription also secures the building of repair shops at Evansville.

**Fitchburg.**—The Boston Advertiser says: "One result of the recent meeting of freight agents in this city is that the business of the New England Transportation line, which has heretofore been divided between the Lowell and Fitchburg railroads, has been entirely transferred to the latter. All freight by that line will hereafter be handled in Boston by the Fitchburg road. The Lowell still has its own water line to the West."

**Flushing, North Shore & Central.**—A decree of foreclosure and sale has been filed under the first mortgage for \$1,000,000, on the former Central Railroad of Long Island, now consolidated with this company. The decree covers the former Central road from Flushing, N. Y., to Babylon, 36 miles, but in that distance are included 16 miles owned by the Stewart estate and held under lease.

**Freehold & Jamesburg.**—This road, heretofore controlled but not directly operated, will hereafter be worked as a part of the Amboy Division of the Pennsylvania Railroad. The road extends from Jamesburg, N. J., to Sea Girt, 27½ miles.

**Hudson River Tunnel.**—It is again reported that this company will soon resume work in Jersey City on its proposed tunnel under the Hudson River to New York. A bill to authorize the taking of land for a terminus in New York failed in the last Legislature, but it is thought that the company has sufficient power under its present charter.

**International & Great Northern.**—The Galveston (Tex.) News, of July 8, says: "Friday afternoon there was a transfer filed for record in the office of County Clerk McMahon, which is the largest recorded in this county for many years. The instrument was a deed of the International & Great Northern Railway by its President, Samuel Sloan, to John S. Kennedy and Samuel Thorn, of New York, and William Walter Phelps, of Bergen County, New Jersey, to 2,954,714.74 acres of land in the counties of Anderson, Atascosa, Colorado, Cherokee, Fort Bend, Freestone, Galveston, Guadalupe, Houston, Henderson, Harris, Jackson, Liberty, Leon, Matagorda, Milam, Montgomery, Newton, Nacogoches, Orange, Polk, Parker, San Jacinto, Trinity, Tyler, Wharton, Williamson, Carson, Gray, Randall, Roberts, Crosby, Cottrell, Dickens, King, Motley, Dimmit, Kincaid, Crockett, Frio, Kinney, La Salle, Maverick, Pecos, Webb and Zavala. The consideration was \$4,628,400, and the instrument bears date of March 10, 1879. This makes the thirtieth county it has been recorded in, and it will be necessary to have it placed on record in every county enumerated in the above list."

**Jacksonville Southeastern.**—This company has been organized for the purpose of buying the Jacksonville, Northwestern & Southeastern, which is soon to be sold under foreclosure, and which now runs from Jacksonville, Ill., to Virden, 31 miles. The articles of incorporation of the new company provide for an extension from Virden to Centralia, about 75 miles.

**James River & Kanawha Canal.**—This company has given notice that it is prepared to transfer its property to the Richmond & Allegheny Railroad Company within ten days. The law authorizing the transfer requires the Richmond & Allegheny Company to deposit within that time \$500,000 as security for its faithful performance of the contract.

**Kansas City Air Line.**—This company has filed articles of incorporation in Illinois for a railroad from a point on the Indianapolis, Decatur & Springfield road near Decatur westward to Roodhouse, on the Chicago & Alton. The distance is about 85 miles, and the capital stock is to be \$600,000.

**Little Rock & Ft. Smith.**—This company will fund the coupons on its first-mortgage bonds due July 1, 1879, and Jan. 1, 1880, in coupon notes bearing 7 per cent. interest.

**Louisville & Nashville.**—The Louisville City Council has repealed the ordinance to submit to a popular vote the question of selling the city stock in this company.

It is announced that the company will take charge directly of the express business over its lines on Aug. 1. The Adams and Southern Express companies will retire from the line on that date.



**Manhattan.**—It is stated that this company, which works the elevated roads in New York, has decided to make an extension of the hours during which low fares are charged. After Aug. 1, it is said, the ten-cent fare will be charged only from noon to 3 p. m., and from 9 p. m. till midnight, five cents being the fare all the rest of the day. This is regarded as preliminary to a reduction to five cents at all hours.

It is reported that the managers of the Metropolitan Company have secured a controlling interest in the lessee.

**Missouri, Iowa & Nebraska.**—Suit has been begun by the Chicago, Rock Island and Pacific to prevent this company from laying its tracks in Keokuk, Ia. The ground of suit is that the track, if laid as proposed, would do serious damage to the Rock Island Company by cutting into its yards and shops and interfering with its business. No objection is made to laying the track, provided a more convenient location is made.

**Mobile & Ohio.**—The following order and decree was last week entered in the United States Circuit Court in Memphis, Tenn.:

"This cause coming on to be heard for further directions, the plaintiffs moved the Court for leave to file the decree of the Circuit Court of the United States for the Southern District of Alabama, in the suit commenced in that Court by W. Butler Duncan and A. Foster Elliott as trustees, and who were appointed receivers of the railroad of Mobile & Ohio Company from Mobile, Ala., to Columbus, Ky., and which suit was enlarged by consolidation with other suits against the Mobile & Ohio Railroad Company to ascertain the debt and enforce the deeds of trust of that corporation, which motion of plaintiffs is not opposed, and the Court allows the same.

"And it appears that William H. Hays and T. A. Dupuy, as the survivors of William S. Pierson, are the owners of 99 per cent. of all the debts of the said Mobile & Ohio Railroad Company secured by the first mortgages of that company as stated in the said decree, including the Tennessee substitution mortgage dated July 1 1871, and fully proven and established in this cause, and that the trustees of the said mortgages, and the owners of the debt aforesaid, concur in the conclusion that the orders of sale should not be executed, and the reasons therefor being satisfactory to this Court, the Court orders that the sale ordered in this Court, and all proceedings under the decree, be suspended.

"The Court accepts so much of the said decree as grants the holders of the bonds aforesaid under the substitution mortgage who have not accepted the terms of the decree of reorganization six months from the date of said decree of June 15, 1879, to avail themselves of the same, and that, in case of failure to do so, the said Hays and Dupuy, or the Mobile & Ohio Railroad Company, or the plaintiffs, may deposit with the Farmers' Loan & Trust Company their proportionate share of such holders of the proceeds of sale, as if sale had been made, and the sum specified in the said decree, to wit: seven millions of dollars, had been obtained at the sale, and the share of the substitution mortgage had been ascertained to be the sum of \$1,500,000.

"This Court ratifies the said decree in so far as its terms applies to the mortgages filed in this Court as the basis of its decree.

"The Court continues to the Receiver, W. Butler Duncan, the powers which were granted to said Duncan and A. Foster Elliott—the said Elliott having died since the last term of the Court—and to have the same effect as if this order had been made before the time of the death of said Elliott."

**Mont Alto.**—This road is now completed to Waynesboro, Pa., three miles beyond the late terminus at Nunnery, and 17 miles from the junction with the Cumberland Valley road. Regular trains now run through to Waynesboro.

**Montreal, Portland & Boston.**—Work is progressing rapidly on the extension of this road from St. Lambert, P. Q., to Longueuil on the St. Lawrence. An amicable arrangement has been made as to the crossing over the Grand Trunk track.

**National.**—This company has been incorporated in Indiana to build a line across the state about 160 miles long, running nearly due east and west and passing through Ft. Wayne, with a branch 72 miles long running east by south to a point on the Ohio line in Adams County. The capital stock is to be \$3,480,000.

**New York & New England.**—The property attached at the suit of N. C. Munson, Contractor, against the Boston, Hartford & Erie Company, was sold at sheriff's sale in Boston last week. The sale nominally includes all the property formerly owned by the company in Suffolk County, Mass., but the New York & New England Company holds, through enforcement of a prior lien, all the property except French's Wharf in Boston. Due notice of this was given at the sale. French's Wharf was sold for \$200,000; the other property for \$170,800, in spite of the fact that a tedious and doubtful litigation will be required to establish any title. Both lots were bought in by Mr. Munson's counsel.

**New York Rapid Transit Lines.**—The New York Board of Aldermen has refused to approve the report of the Rapid Transit Commission, recommending the building of a new elevated road through Fourth avenue, and also several lines north of the Harlem River. It is claimed, however, that this action is premature, and that the Commission can go on with its work, which is not yet finished.

**Ohio & West Virginia.**—At a recent meeting of the stockholders in Columbus, O., it was voted to increase the capital stock from \$250,000 to \$2,500,000. It was also resolved to push the work of construction from Logan, O., to Gallipolis as fast as possible.

**Philadelphia & Reading.**—This company's statement for May and the six months of its fiscal year from Dec. 1, to May 31, is as follows:

	May.	1878.	Six months.	1878.
Gross receipts:				
Railroad traffic	\$1,144,051	\$1,101,497	\$5,550,182	\$4,983,095
Canal traffic	101,866	124,967	265,673	201,361
Steam colliers	63,106	51,291	344,110	275,680
Richmond barges	23,324	8,230	64,345	35,006
Total R. R. Co.	\$1,332,347	\$1,286,015	\$6,233,310	\$5,475,772
Coal & Iron Co.	1,015,641	683,095	4,184,701	2,961,692
Total	\$2,348,188	\$1,969,710	\$10,418,011	\$8,437,464
Traffic:				
Passengers carried	649,941	523,395	3,143,956	2,978,331
Tons merchandise	459,317	287,903	1,852,261	1,572,072
Tons coal	828,322	513,614	3,489,004	2,204,007
Tons coal on colliers	59,039	60,999	291,474	267,006
Tons coal mined:				
By Coal & Iron Co.	\$418,642	\$240,057	\$1,797,298	\$1,043,810
By tenants	122,562	103,053	556,214	308,532
Total	\$541,204	\$343,110	\$2,353,512	\$1,442,342

For May the railroad company increased its gross receipts

\$46,532, or 3.6 per cent.; both companies, \$378,478, or 19.2 per cent. For the half year the increase for the railroad company was \$757,538, or 13.8 per cent.; for both companies, \$1,980,547, or 23.5 per cent.

**Paris & Danville.**—It is said that this road, lately sold at foreclosure sale, is to be extended from Lawrenceville, Ill., southward about nine miles to a connection with the Cairo & Vincennes. This will complete a new line from Chicago to Cairo in connection with the Chicago & Eastern Illinois, and will also give the Wabash Company, which is understood to control the Paris & Danville, a line to Cairo.

**Pennsylvania Railroad in Maryland.**—At the recent annual meeting in Cumberland, Md., M. A. Healey, a stockholder, claimed that the transfer of certain stock to Mr. Henry Loveridge and others, representing the George's Creek & Cumberland road, was void, because the consideration for which the stock was transferred had failed. His claim being disallowed, he seceded, and elected a board by himself. Several of the parties chosen by him, however, have refused to serve, and the stockholders generally favor the properly elected board.

**Pine River Valley & Stevens Point.**—This company has executed a mortgage for \$250,000 on its road, and purposes selling bonds to that amount to pay for the extension of its road from Richland Centre, Wis., north by east to Stevens Point, about 90 miles. The road is now in operation from Richland Centre southward 16 miles to Lone Rock on the Chicago, Milwaukee & St. Paul.

**Pittsburgh & Lake Erie.**—The Pittsburgh Telegraph of July 5 says: "Some two months ago, when a connection was talked of between the Baltimore & Ohio and Pittsburgh & Lake Erie railroads by barge transfer, the latter road at once took hold of the matter with their accustomed vigor, and commenced the construction of the incline. It was necessary in the first place to have the piles sunk, and after this was done they commenced work under the direction of General Manager W. C. Quincy. The work is now finished, and a description of it will no doubt be interesting. The incline commences from a point near the American Iron Works, where the trestle work is about forty feet from top of rail to the water. The incline then runs down the river about 700 to 800 ft. at a grade of about 3 1/2 ft. to the 100, until it strikes the water opposite the mill of Messrs. Moorhead, McClain & Co. A barge, nearly 200 ft. long, has been constructed; the cars are run down the incline on to the barge and by means of a tug-boat are towed to any point inside the first pool. The first transfer was made yesterday. Five cars of ore from Cleveland, for Moorhead & Co., were run on the barge and safely towed over to their mill. This is an important matter for the manufacturers of Pittsburgh. It is demonstrated that a rail connection is not at all necessary to bring the different mills and factories in connection with the Pittsburgh & Lake Erie Railroad; freight can be placed at any point on the Allegheny or Monongahela River by means of this transfer, and when the Davis Island dam is completed all the mills and factories below the dam can avail themselves of this mode of utilizing the new line. The way this transfer will be worked is similar to the method employed in New York harbor, where nine-tenths of all the rail traffic is lightered by barge transfer. Mr. Quincy, of the Pittsburgh & Lake Erie Railroad, deserves credit for the promptness with which the idea has been carried out. The cost to parties having their freight transferred in this manner will be merely nominal. The rates have not yet been established. The cost, however, will be much cheaper than if hauled by teams, and much more satisfactory, because the freight is delivered to consignees without breaking bulk. When the Baltimore & Ohio Railroad concludes to build a similar incline on this side of the river, the connection between the two companies will thus be completed."

**Portland & Rochester.**—It has been decided to sell the large interest in this road held by the city of Portland, Me., to George P. Westcott for \$256,500. Mr. Westcott is President and Receiver of the road and, in this matter, represents the first-mortgage bondholders.

**St. Louis, Kansas City & Northern.**—Work on the new Omaha line, from Pattonsburg, Mo., northwest to Council Bluffs, has been pushed for some time past, and a large part of the grading is now completed. Track is reported laid from Pattonsburg out about 25 miles, with the rails going down as fast as possible.

The reported consolidation with the Wabash Company is referred to elsewhere.

**St. Louis, Kansas City & Northern and Wabash Consolidation.**—The New York American Exchange of July 9 says: "It is officially announced that the holders of a controlling interest in the securities of the Wabash and the St. Louis, Kansas City & Northern railroad companies have agreed to a plan for consolidation of the two companies. Mr. Cyrus W. Field, President of the Wabash Railway Company, stated yesterday that the papers forming the agreement had been signed last Thursday, but the consolidation will require the formal approval of the stockholders of both companies, which cannot be obtained except after 60 days' notice. No unnecessary delay will take place, however, but the consolidation will be consummated as soon as possible.

"The new company will be known as the Wabash, St. Louis & Pacific Railway Company, and its head-quarters will probably be located at St. Louis. Its capital stock will be \$40,000,000, divided equally into preferred and common stock. The preferred stock will be entitled to 7 per cent. per annum in dividends before any dividends will be paid on the common stock. The capital stock of the St. Louis, Kansas City & Northern Railway Company is now \$24,000,000, divided into \$12,000,000 preferred stock and \$12,000,000 common stock. The Wabash Railway Company has a capital stock of \$16,000,000, there being no preferred stock. Under the proposed plan of consolidation the stocks of the St. Louis, Kansas City & Northern Company will be practically unchanged, but for every two shares of the Wabash Company's stock there will be issued one share of preferred and one share of common stock of the new consolidated company.

"The bonded debt of the Wabash, St. Louis & Pacific Company will be about \$36,000,000, being at the rate of \$25,000 per mile on the present length of road owned and operated by the two companies. With all the leases of the companies capitalized each corporation will be represented by the following amount of debt in the consolidated company:

St. Louis, Kansas City & Northern... \$14,000,000  
Wabash, including its new \$2,000,000 mortgage, about... 22,000,000  
Total... \$36,000,000

"With the Chicago and Detroit extensions of the Wabash Company completed, the bonded debt of the consolidated company will be about \$22,000 per mile. It is probable that the mortgages on the Wabash and the St. Louis, Kansas City & Northern properties will be converted into one consolidated mortgage covering the entire property.

"It is understood that the President of the Wabash, St.

Louis & Pacific Railway Company will be Mr. Cyrus W. Field. There will probably be two vice-presidents—Mr. A. L. Hopkins, now Vice-President of the Wabash Company, and Mr. B. W. Lewis, Jr., now President of the St. Louis, Kansas City & Northern Company. Messrs. Jay Gould, Russell Sage, Solon Humphreys, Sydney Dillon, William R. Garrison, B. W. Lewis, Jr., and James F. Joy, of Detroit, will be directors in the consolidated company. The new organization will not be operated in any way inimical to the interests of the Missouri Pacific Railroad Company."

**St. Louis, Keokuk & Northwestern.**—The track of this road is reported laid to the connection with the St. Louis, Kansas City & Northern at Dardenne, Mo., about 40 miles south by east from the late terminus at Clarksville. This completes the road, which is now 138 miles long, following down the west bank of the Mississippi from Keokuk, Ia., to Clarksville and then turning a little inland to run south and east until it strikes the St. Louis, Kansas City & Northern at Dardenne, 32 miles from St. Louis. An agreement for exchange of business and for a through line between St. Louis and Keokuk has already been concluded with that company.

**St. Paul, Minneapolis & Manitoba.**—This company has filed in Dakota, a certificate of its intention to build a branch from a point on the Red River opposite Breckenridge, Minn., northwest to the Northern Pacific, near Casselton. The distance is about 50 miles.

**St. Louis & Southeastern.**—In the United States Circuit Court in Springfield, Ill., July 3, Judd & Whitehouse, of Chicago, as attorneys for Carl Wertheim and others, of Amsterdam, Holland, filed a bill to foreclose the first mortgage on the St. Louis Division. The bill sets forth that plaintiffs represent about two-thirds of the bonds; that the trustees are largely interested in the consolidated or second-mortgage bonds and are prosecuting a suit to foreclose that mortgage, and therefore they bring the suit directly, instead of acting through the trustees. The bill brings in as defendants the company, the trustees under the consolidated mortgage and a number of other creditors. There is no desire to change the management, and plaintiffs will ask for the appointment of Gen. J. H. Wilson, the present Receiver, as Receiver in their suit.

The first mortgages amount to \$3,355,000, of which \$2,250,000 are secured on the line in Illinois, \$1,000,000 on the line in Indiana, and \$105,000 on the O'Fallon Branch. The interest on all these bonds has been in default since 1874. Most of them are held in Holland.

**St. Louis, Wichita & Western.**—A large force is reported at work on this road, which is to be a branch or extension of the St. Louis & San Francisco road through Southern Kansas to Wichita.

**St. Martins & Upham.**—This road is now completed from the junction with the Intercolonial at Hampton, N. B., to Quaco, about 27 miles. Some two miles remain to be laid to complete the road through Quaco and to the terminus at tide-water near that village. There is some heavy bridging on the line, which has been built by Wm. Starkey, contractor for the superstructure, and J. G. McDonald for the masonry. The road is laid with iron rails taken up from the Intercolonial and given to this company by the Dominion government.

**Salina & Southwestern.**—Track on this road has been laid from Salina, Kan., on the Kansas Pacific, 185 miles west of Kansas City, southward to Lindsborg, 20 miles. The tracklayers began their work on this section June 13, and finished it July 2. Work is in progress on an extension from Lindsborg south to McPherson Centre, 25 miles. The road is controlled by the Kansas Pacific, and will be worked as a branch of that line.

**Salisbury.**—The directors last week resolved to extend this road two miles beyond its present terminus, near Salisbury, Pa., and also to build a branch 1 1/2 miles long. Both extensions are for the purpose of reaching coal mines.

**Sharpsville.**—A new contest has broken out between this company and the Pennsylvania Company, the latter having ordered the removal of certain tracks from the Erie & Pittsburgh right of way at the crossing of the two roads. At latest accounts both roads were trying to keep trains upon the disputed tracks, and neither was ready to give way.

**Southern, of Long Island.**—A decree of foreclosure and sale has been granted under the mortgage for \$500,000 covering the Rockaway and Hempstead branches. These were not included in the late foreclosure sale of the main line, and their sale is necessary to complete the reorganization.

**Troy & Boston.**—It is announced that Mr. William H. Vanderbilt has bought of D. T. Vail, late Treasurer of this company, 2,500 shares of its stock at 50. This is very much above its apparent value, and probably above its market price, though that is not easy to get at, as it is a stock not dealt in anywhere. It is not a controlling interest, as the capital stock by the last report was \$1,609,010, but it is stated that 3,000 more shares are held in the Vanderbilt interest, and the control of other shares is pledged to Mr. Vanderbilt. It is also said that Mr. Vanderbilt is to be President, and that the road will be worked directly by the New York Central.

The Troy & Boston has a heavy debt, and of late it has been somewhat embarrassed owing to alleged mismanagement and complications resulting from outside speculations of its managers. Its chief importance is that it holds, by ownership and lease, the 47 1/2 miles of road from Troy to the Hoosac Tunnel, giving the New York Central its connection with the Tunnel Line to Boston.

**Union Pacific.**—A dispatch from Omaha, Neb., July 9, says: "The important announcement is made to-day that the Union Pacific proposes building this year from a point on the line of the Omaha & Republican Valley Branch, to Lincoln, thence to Beatrice, thence to Marysville, Kan., intersecting there the St. Joseph & Denver City Line; ultimately to some point on the Kansas Pacific. A proposition has been made to Gage County, of which Beatrice is the county seat, asking \$30,000 in county bonds and \$40,000 in precinct bonds. An election has been ordered for Aug. 12. The road is to be completed to Beatrice on Jan. 1, 1880. A proposition has been made also to Marshall County, Kan. The Republican Valley Road will also be completed to the main line of the Union Pacific, and, with the Omaha, Niobrara & Black Hills road, which will undoubtedly be built this year to Niobrara, will give the Union Pacific a north and south line across the entire state."

**Wabash.**—This company offers to its stockholders \$1,000,000 of the issue of \$2,000,000 new bonds lately authorized. The bonds bear 7 per cent. interest, have 30 years to run and are secured by a mortgage to Solon Humphreys and Daniel A. Lindley, trustees. A sinking fund of \$25,000 a year is provided. Sealed proposals for the purchasers of the bonds will be received from stockholders of the company until July 25.

It is reported that negotiations are in progress for the use



by this road of one of the two lines between Toledo and Detroit. One of these is owned by the Lake Shore and one by the Canada Southern. In case Mr. Vanderbilt declines to part with one of these lines, it is said that a third line will certainly be built.

The proposed consolidation with the St. Louis, Kansas City & Northern is referred to elsewhere.

The United States Circuit Court in Chicago has refused to grant a motion to remand to the state court the so-called Tyson foreclosure suits. It is held that the case is properly before the Court, and that it has full jurisdiction in the case.

**Western Union.**—Further statements concerning the settlement in the case of this company are that the Chicago, Milwaukee & St. Paul Company in taking the lease of the road agrees to pay the coupon due Feb. 1, 1879, on which default was made, and to pay interest in full up to July 1. The 7 per cent. Western Union bonds are to be exchanged for an equal amount of new 6 per cent. bonds issued by the Chicago, Milwaukee & St. Paul, dated July 1 and bearing interest from that date. This will make the annual rental of the road 6 per cent. on \$3,500,000 bonds, or \$210,000, which is \$987 per mile. This sum is considerably less than the net earnings for several years past.

**Willamette Valley.**—In the United States Circuit Court at Portland, Oregon, June 26, the application of the Pacific Rolling Mill Company for a receiver for this road was referred to a master, with power to appoint. The road is of 3-ft. gauge and extends from Dayton, Oregon, to Dallas, 27 miles, with a branch to Sheridan, 8 miles.

**Woodruff Sleeping & Palace Coach Co.**—This company's lines have been extended over the Virginia Midland road.

### ANNUAL REPORTS.

The following is an index to the reports of companies which have been reviewed in previous numbers of this volume of the *Railroad Gazette*:

Page.	Page.
Allegheny Valley..... 277	Kentucky Central..... 261
Atchison, Topeka & Santa Fe..... 277	Lake Shore & Mich. South..... 261
Atlanta & Charlotte Air Line..... 294	Lehigh Valley..... 261
Atlantic & Great Western..... 172, 179	Leavenworth, Lawrence & Gal..... 261
Baltimore & Potomac..... 322	Little Miami (P. C. & St. L.)..... 261
Boston & Albany..... 78	Long Island..... 12
Boston, Clinton, Fitch & N. B..... 12	Maine Central..... 179
Boston, Concord & Montreal..... 322	Manchester & Lawrence..... 261
Boston & Lowell..... 46	Marquette, Houghton & Ont..... 261
Boston & N. Y. Air Line..... 32	Memphis & Charleston..... 191
Camden & Atlantic..... 372	Michigan Central..... 262, 266, 277
Central of Iowa..... 151	Mississippi & Tennessee..... 247
Central of New Jersey..... 302	Mobile & Montgomery..... 320
Central Pacific..... 302	Montpelier & Wells River..... 152
Charlotte, Col. & Augusta..... 121	Morris & Essex..... 248
Charters (P. C. & St. L.)..... 205	Nashua & Lowell..... 322
Chesapeake & Ohio Canal..... 322	Natchez, Jack. & Col..... 247
Chicago & Alton..... 185	New Jersey Midland..... 12
Chl., Burlington & Quincy..... 136	N. Y. Lake Erie & West..... 43
Chicago & East. Illinois..... 192	N. Y. N. H. & Hartford..... 43
Chicago, Mil. & St. Paul..... 322	N. Y. Providence & Boston..... 12
Chl., Rock Island & Pacific..... 372	New York State Engineer..... 127
Cin. & Mus. Val. (P. C. & St. L.)..... 205	Northeastern (S. C.)..... 40
Cleve., Col., Cin. & Ind..... 196	Northern Central..... 121
Cleve. & Pittsburgh..... 218	Northern New Hampshire..... 304
Cleve., Tus. Val. & Wheeling..... 218	North Pennsylvania..... 101
Col., Chic. & Ind. Cent. (P. C. & St. L.)..... 205	Ohio & Mississippi..... 101
Col. & Rock. Valley..... 305	Oregon & California..... 266
Columbus & Toledo..... 320	Pacific & Elkhart..... 248
Concord..... 292	Panama..... 248
Connecticut River..... 66	Pennsylvania..... 128, 139
Dakota Southern..... 66	Pennsylvania Company..... 218
Dayton & Southern..... 106	Pennsylvania & New York..... 348
Delaware..... 54	Pensacola & Perdido..... 348
Delaware & Hudson Brook..... 248	Philadelphia & Reading..... 348
Delaware & Bay Bridge..... 248	Phila., W. & Baltimore..... 34
Del. Lack. & Western..... 77	Pitts., Cin. & St. Louis..... 205
Detroit & Bay City..... 344	Pitts., Ft. W. & Chi. (Penna.)..... 79
Detroit, Lan. & No..... 304	Pitts., Titusville & Buffalo..... 211, 218
Delaware Western..... 152	Pitts., W. & Ky. (P. C. & St. L.)..... 305
Eastern..... 152	Portland & Ogdensburg..... 248
El River..... 106	Providence & Worcester..... 292
Erie & Pittsburgh (Penna. Co.)..... 218	Richmond & Danville..... 91
Fitchburg..... 24	Richmond, Fred. & Potomac..... 78
Galv., Houston & Henderson..... 34	Rock Island & Peoria..... 248
Georgia..... 304	Rome, W. Town, & Ogdensburg..... 247
Grand Trunk..... 277	St. Louis, Iron Mt. & Southern..... 180
Great Western of Canada..... 278	St. Louis, Kan. City & Northern..... 180
Hannibal & St. Joseph..... 192	St. Louis & Southeastern..... 320
Hartford, Prov. & Fishkill..... 129	St. Louis, Van. & Terre Haute..... 78
Havana, Rantoul & Eastern..... 232	Scioto Valley..... 319
Housatonic..... 152	Southern Central..... 248
Hunt & Broad Top Mountain..... 66	Troy & Boston..... 34
Illinois Central..... 56, 106	Union Pacific..... 163
Illinois Railroad Commission..... 117	U. S. Rolling Stock Co..... 77
Indianapolis, Bloom. & West..... 262	Utica & Black River..... 262
Ind. & Vincennes (Penna. Co.)..... 218	Wabash..... 192
International & Gt. Northern..... 205	Washington & Annapolis..... 79
Iowa Railroad Commission..... 6	Western Railroad Association..... 348
Jeff., Mad. & Ind. (Penna. Co.)..... 218	Wilmington & Northern..... 348
Kan. City, St. Joe & C. Hurst..... 308	Wm. Railroad Commission..... 79
Kansas Pacific..... 121	Worcester & Nashua..... 106

### Mobile & Girard.

This company owns a line from Columbus, Ga., to Troy, Ala., 84 miles. Its report covers the year ending May 31, 1879.

The equipment consists of 4 locomotives; 5 passenger and 8 baggage, mail and express cars; 31 box, 31 platform, 4 coal and 3 conductors' cab cars. One locomotive is also leased from the Central Railroad of Georgia.

The bonded debt consists of \$800,000 second mortgage 8 per cent. bonds; \$800,000 third mortgage 4 per cent.; \$33,000 third mortgage 6 per cent., and \$500 plain bonds. The annual interest charge is \$57,980. The stock is divided into \$987,084.80, common; \$270,745.84, preferred, and \$12,130 Pike County stock. The general account is as follows:

Stock, all classes (\$15.229 per mile).....	\$1,278,940.64
Bonds (\$13.494 per mile).....	1,133,500.00
Central R. R. of Georgia.....	8,039.18
Total.....	\$2,420,479.82
Construction and stock interest (\$23.932 per mile).....	\$2,010,310.71
Profit and loss.....	384,569.32
Central R. R. Bank.....	17,000.00
Cash and balances.....	8,599.79
Total.....	2,420,479.82

Locomotives ran during the year 104,000 miles; the cost for fuel was 4.05 cents per mile run. There were 91,485 passengers carried, and 60,243 bales cotton; of the latter 27,404 bales were through to Columbus, 17,981 way and 14,858 were carried to Union Springs, the Montgomery & Enfield crossing.

The earnings for the year was as follows:

1878-79.	1877-78.	Inc. or Dec.	P. C.
Passengers.....	\$36,758.04	\$33,030.87	I. 3,727.77 11.3
Freight.....	155,800.19	142,452.03	I. 16,007.14 11.7
Mails.....	3,348.98		
Total.....	\$195,907.81	\$175,572.90	I. 20,334.91 11.6
Expenses.....	135,572.60	112,274.32	I. 23,298.37 20.7
Net earn.....	\$60,335.12	\$63,298.58	D. 2,963.46 4.7
Gross earn. per mile.....	2,332.24	2,090.15	I. 242.09 11.0
Net earn. per mile.....	718.28	753.55	D. 35.27 4.7
Per cent. of expenses.....	60.21	63.94	I. 5.27 8.2

Increase in earnings was due to favorable crops along the

line. Expenses were increased by unusually heavy renewals of road. The income account was as follows:

Cash, May 31, 1878.....	\$200.47
Gross earnings.....	195,907.81
Sundry accounts, profit and loss, etc.....	6,430.60
Total.....	\$202,638.88
Expenses.....	\$135,572.60
Interest.....	57,570.00
Central R. R. of Georgia.....	6,860.00
Sundry accounts.....	1,181.82
Total.....	201,184.51

Cash, May 31, 1879..... \$1,432.37

During the year all the old flange rail remaining in the main track was replaced. There was used for that purpose 382½ tons of T rail, 40 lbs. to the yard, and 53½ tons, 57 lbs. to the yard. There were 24,550 new ties laid. Several new buildings were put up, and the equipment fully maintained. An iron bridge over Uchee Creek is recommended. The results of the year are considered favorable. All bills have been promptly settled, and there is no floating debt. But light renewals are needed the present year.

One accident occurred, a butting collision in December which was caused by disobedience of orders by trainmen.

### Cincinnati, Hamilton & Dayton.

This Company works the following lines:

	Miles.
Cin., Hamilton & Dayton, owned, Cincinnati to Dayton.....	80
Dayton & Michigan, leased, Dayton to Toledo.....	142
Cin., Richmond & Chicago, leased, Hamilton, O., to Richmond, Ind.....	45
Cin., Ham. & Indianapolis, Hamilton, O., to Indianapolis....	98

Total..... 345

The Cincinnati, Hamilton & Indianapolis is practically owned, though nominally under a separate organization. The report is for the year ending March 31, 1879.

The equipment consists of 84 engines; 61 passenger, 3 mail and 23 baggage cars; 1,082 box, 174 stock, 230 coal, 396 flat and 31 caboose cars; 5 wrecking, 74 hand and 71 truck cars. Changes are an increase of 6 passenger, 101 box and 27 coal cars; a decrease of 3 engines, 19 stock cars and 20 flat cars.

The general account, condensed, is as follows:

Stock, (\$58,333 per mile).....	\$3,500,000.00
Bonds, (\$45,583 per mile).....	2,735,000.00
Surplus earnings.....	1,534,793.84
Interest, dividend and rental accounts.....	111,147.99
Bills payable.....	200,714.38
Accounts and balances due.....	180,223.00

Total..... \$8,370,879.21

Road and property (\$88,691 per mile) \$5,321,437.73  
Stocks and Bonds..... 965,907.34  
D. McLaren, Trustee..... 86,924.57  
Lease and guarantee accounts..... 1,599,502.01  
Cash, materials and receivables..... 397,107.56

Total..... \$8,370,879.21

The bonded debt includes \$1,245,000 first, \$494,000 second and \$896 consolidated bonds. The floating debt is \$370,853.58, to which should be added two items in dispute, \$252,000 coupons due on Cincinnati, Hamilton & Indianapolis bonds and \$26,381.30 on guarantee of Cincinnati, Richmond & Ft. Wayne bonds. To meet this the company holds \$235,000 of its own consolidated bonds, and \$25,000 Cincinnati, Richmond & Chicago bonds.

The \$965,907.34 credited to stocks and bonds represent securities of a par value of \$2,634,850, as follows: \$700,000 Cincinnati, Hamilton & Indianapolis bonds; \$375,100 Cincinnati, Richmond & Chicago stock and \$90,000 bonds; \$1,398,100 Dayton & Michigan stock; \$25,000 Cincinnati Elevator stock; \$36,000 Dayton & Union income bonds and \$6,850 stock; \$2,800 Cincinnati, Hamilton & Dayton stock.

The capital accounts of the leased lines are as follows:

Dayton & Mich.	Cin. Rich. & Chi.	Cin. Ham. & Ind.
Stock.....	\$3,012,778	\$382,600
Bonds.....	2,728,800	925,000
Due less.....	531,733	917,856
Other accounts.....	164,921	262,500
Total.....	\$7,038,232	\$1,020,985

There are now overdue four coupons on the Cincinnati, Hamilton & Indianapolis bonds, of which \$1,800,000 are outstanding, the balance being held by the lessee. In the six years this road has been operated there has been a loss of \$1,071,203.02, besides \$689,653.38 advanced for construction. Negotiations are nearly completed for a settlement with the bondholders.

The earnings of the entire system for the year were:

1878-79.	1877-78.	Inc. or Dec.	P. C.
Passengers.....	\$726,929.80	\$707,702.74	D. 19,227.06 2.6
Freight.....	1,370,418.44	1,395,526.79	D. 25,108.35 1.8
Mail and express.....	78,915.03	76,527.22	I. 2,387.81 3.1
Miscellaneous.....	90,234.86	108,927.17	D. 18,692.31 17.9
Indianapolis pool.....	26,277.84	17,032.16	I. 9,245.68 54.4

Total..... \$2,298,775.97

Less Dayton pool..... 16,203.25

Total..... \$2,282,572.72

Expenses..... \$2,362,801.90

Taxes..... 1,441,403.13

Total..... \$1,543,001.35

Net earnings..... \$739,571.37

Gross earnings..... 6,616.15

Net earn. p. mile..... 2,143.60

Per cent. work- ing expenses..... 63.14

Per cent. ex- penses and taxes..... 67.80

The earnings and payments were divided as follows:

Earnings.	Expenses and Interest.	Gain or loss.	Earn. per mile.
C. H. & D.....	\$807,210.83	\$768,017.57	G. 1,141,182.26 \$15.048
D. & M.....	845,237.77	807,187.24	L. 1,141,182.26 \$15.048
C. R. & C.....	188,448.42	188,180.60	L. 8,738.18 4.188
C. H. & I.....	341,075.70	263,508.63	G. 78,167.07 3.487

Total..... \$2,282,572.72

Had interest been paid on the Cincinnati, Hamilton & Indianapolis bonds, however, that road would have showed a loss of \$96,732.98, and the whole system a gain of \$31,672.68 only.

The earnings per train-mile and per unit of traffic were as follows, in cents:

1878-79.	1877-78.	Inc. or Dec.	P. C.
Per passenger train mile.....	108.00	102.80	I. 5.20 5.1
Per freight train mile.....	227.00	190.50	I. 27.50 13.8
Per passenger per mile.....	2.193	2.450	D. 0.256 10.6
Per ton per mile.....	1.398	1.564	D. 0.166 10.6

Toledo business included 9,024 cars lumber forwarded and 5,837 cars grain received. The total number of loaded cars handled there was 35,681, an increase of 2,224. At Richmond 13,813 loaded cars were handled, a decrease of 359. There were 1,968 car-loads of pig-iron carried from Cincinnati.

The road suffered from low rates and increased competition, the new Columbus & Toledo road having cut badly into the Toledo business. The business from the Atlantic &

Great Western was generally unprofitable, owing to the low rates and the refusal of the through traffic to make allowance for terminal expenses. It is estimated that when rates are 15 cents per 100 lbs. between Cincinnati & New York, the proportion received by this road on its 60 miles' haul is less than the actual cost for car mileage and terminals, while on a 20-cent rate barely one cent per car per mile is realized.

Usual improvements and renewals were made. On the line owned 844 tons new steel and 29,348 ties were laid, 3,600 feet new sidings built and two bridges rebuilt. The main track is now all steel. On the Dayton & Michigan 1,593 tons steel and 45,518 ties were used, several bridges and Toledo dock rebuilt and a new office building put up at Toledo. On the Richmond road 505 tons iron and 18,340 ties were laid. On the Indianapolis line 493 tons iron and 24,221 ties were laid and extensive repairs made to bridge.

### West Jersey.

The company worked the following lines during the year 1878, as during the previous year:

	Miles.
West Jersey, Camden, N. J., to Millville.....	40.83
Glassboro to Bridgeton.....	18.60
Cape May & Millville, Millville to Cape May.....	41.35
Salem R. R., Elmer to Salem.....	16.58
Swedesboro R. R., Woodbury to Swedesboro.....	10.86

Total..... 128.16

The system forming a main line from Camden to Cape May, 82.18 miles, with branches to Swedesboro, to Bridgeport and to Salem. The Cape May & Millville is practically owned, and large interests are held in the other leased lines.

The equipment consists of 20 locomotives; 52 passenger, 7 combined and 4 baggage cars; 30 box, 2 stock, 60 flat and 130 dump cars; 46 hand and track cars.

The general account is as follows:

Stock (\$22,880 per mile).....	\$1,359,750.00
Bonds (\$40,384 per mile).....	2,400,000.00
Accounts and balances.....	71,539.27
Profit and loss.....	39,691.80

Total..... \$3,870,881.07

Road and property (\$41,000 per mile) \$2,437,250.93  
Stocks, bonds, lands, etc..... 1,146,176.83  
Sinking fund..... 150,250.00  
Cash, materials and receivables..... 129,217.31

Total..... \$3,870,881.07

The sinking funds hold \$152,500 West Jersey, \$49,500 Swedesboro, \$2,500 Salem and \$45,000 Cape May and Millville bonds. The stocks and bonds owned include \$250,000 Stockton Hotel stock, the rest being chiefly securities of leased lines.

The earnings for the year were as follows:

1878.	1877.	Inc. or Dec.	P. C.
Passengers.....	\$323,039.78	\$358,010.35	D. 34,970.57 9.8
Freight.....	159,782.29	178,156.81	D. 16,374.52 9.8
Mails, express, etc.....	58,856.03	60,854.88	D. 1,998.85 3.3

Total..... \$541,678.10

Expenses..... 338,692.31

Net earnings..... \$202,985.79

Gross earn. p. mile..... 4,226.58

Net..... 1,583.84

Per cent. of ex- penses..... 62.53

The decrease in earnings was due to lower rates on passenger business, leaving a decrease in passenger earnings with an increase in traffic. The reduction was made necessary not by direct competition to Cape May, but by the indirect competition of other sea-side resorts, to which a great travel was induced by extremely low fares. To take pleasure-seekers, especially excursionists and transient travelers to the Cape, it was therefore necessary to reduce fares. There was also a loss both in traffic and rates on freight. The mail business, an important item, fell off considerably. Expenses were reduced by care and strict economy.

The expenses were divided as follows:

W. J. and Gross.	Per cent.	Net earn.	Loss.
Cape May earn.....			
Millville.....	\$503,283.04	197,456.77	60.77
Salem.....	22,336.78	2,336.77	89.58
Swedesboro.....	16,058.28	3,201.25	80.06

Charges on the Cape May & Millville road were \$41,320.

The income and profit and loss accounts were as follows:

Net earnings.....	\$202,985.79
Interest on investments.....	31,610.69
Total.....	\$234,596.78
Interest, West Jersey bonds.....	\$154,000
Interest, dividends, etc., leased lines.....	74,354
Total.....	228,354.00